EXHIBIT B

AO 88B (Rev. 12/13) Subpoena to Produce Documents, Information, or Objects or to Permit Inspection of Premises in a Civil Action

UNITED STATES DISTRICT COURT

for the

District of Delaware

BEARBOX LLC and AUSTIN STORMS, *Plaintiff*	)	
v.	)	Civil Action No. 21-534-MN
LANCIUM LLC, MICHAEL T. MCNAMARA, and RAYMOND E. CLINE, JR., *Defendant*	)	

SUBPOENA TO PRODUCE DOCUMENTS, INFORMATION, OR OBJECTS OR TO PERMIT INSPECTION OF PREMISES IN A CIVIL ACTION

To: GREAT AMERICAN MINING, INC., c/o REGISTERED AGENT SOLUTIONS, INC., 9 E. LOOCKERMAN STREET SUITE 311, Dover, DE 19901

(Name of person to whom this subpoena is directed)

☑ *Production:* **YOU ARE COMMANDED** to produce at the time, date, and place set forth below the following documents, electronically stored information, or objects, and to permit inspection, copying, testing, or sampling of the material: See Schedule A

Place:	Date and Time:
Barnes & Thornburg, LLP - ATTN: Adam Kaufmann One N. Wacker Drive, Suite 4400 Chicago, IL 60606-2833	11/10/2021 5:00 pm

❒ *Inspection of Premises:* **YOU ARE COMMANDED** to permit entry onto the designated premises, land, or other property possessed or controlled by you at the time, date, and location set forth below, so that the requesting party may inspect, measure, survey, photograph, test, or sample the property or any designated object or operation on it.

Place:	Date and Time:

The following provisions of Fed. R. Civ. P. 45 are attached – Rule 45(c), relating to the place of compliance; Rule 45(d), relating to your protection as a person subject to a subpoena; and Rule 45(e) and (g), relating to your duty to respond to this subpoena and the potential consequences of not doing so.

Date: 10/29/2021

CLERK OF COURT

OR

/s/ Adam Kaufman

Signature of Clerk or Deputy Clerk *Attorney's signature*

The name, address, e-mail address, and telephone number of the attorney representing *(name of party)* Defendants , who issues or requests this subpoena, are:

Adam Kaufman, One N. Wacker Drive, Suite 4400, Chicago, IL 60603-2833, (312) 214-8319, adam.kaufman @btlaw.com

Notice to the person who issues or requests this subpoena

A notice and a copy of the subpoena must be served on each party in this case before it is served on the person to whom it is directed. Fed. R. Civ. P. 45(a)(4).

Civil Action No. 21-534-MN

PROOF OF SERVICE

(This section should not be filed with the court unless required by Fed. R. Civ. P. 45.)

I received this subpoena for *(name of individual and title, if any)* ______________________

on *(date)* __________ .

❐ I served the subpoena by delivering a copy to the named person as follows: ______________________

______________________ on *(date)* __________ ; or

❐ I returned the subpoena unexecuted because: ______________________

______________________ .

Unless the subpoena was issued on behalf of the United States, or one of its officers or agents, I have also tendered to the witness the fees for one day's attendance, and the mileage allowed by law, in the amount of

$ __________ .

My fees are $ __________ for travel and $ __________ for services, for a total of $ 0.00 .

I declare under penalty of perjury that this information is true.

Date: __________

____
Server's signature

____
Printed name and title

____
Server's address

Additional information regarding attempted service, etc.:

Federal Rule of Civil Procedure 45 (c), (d), (e), and (g) (Effective 12/1/13)

(c) Place of Compliance.

(1) ***For a Trial, Hearing, or Deposition.*** A subpoena may command a person to attend a trial, hearing, or deposition only as follows:
(A) within 100 miles of where the person resides, is employed, or regularly transacts business in person; or
(B) within the state where the person resides, is employed, or regularly transacts business in person, if the person
(i) is a party or a party's officer; or
(ii) is commanded to attend a trial and would not incur substantial expense.

(2) ***For Other Discovery.*** A subpoena may command:
(A) production of documents, electronically stored information, or tangible things at a place within 100 miles of where the person resides, is employed, or regularly transacts business in person; and
(B) inspection of premises at the premises to be inspected.

(d) Protecting a Person Subject to a Subpoena; Enforcement.

(1) ***Avoiding Undue Burden or Expense; Sanctions.*** A party or attorney responsible for issuing and serving a subpoena must take reasonable steps to avoid imposing undue burden or expense on a person subject to the subpoena. The court for the district where compliance is required must enforce this duty and impose an appropriate sanction—which may include lost earnings and reasonable attorney's fees—on a party or attorney who fails to comply.

(2) ***Command to Produce Materials or Permit Inspection.***
(A) *Appearance Not Required.* A person commanded to produce documents, electronically stored information, or tangible things, or to permit the inspection of premises, need not appear in person at the place of production or inspection unless also commanded to appear for a deposition, hearing, or trial.
(B) *Objections.* A person commanded to produce documents or tangible things or to permit inspection may serve on the party or attorney designated in the subpoena a written objection to inspecting, copying, testing, or sampling any or all of the materials or to inspecting the premises—or to producing electronically stored information in the form or forms requested. The objection must be served before the earlier of the time specified for compliance or 14 days after the subpoena is served. If an objection is made, the following rules apply:
(i) At any time, on notice to the commanded person, the serving party may move the court for the district where compliance is required for an order compelling production or inspection.
(ii) These acts may be required only as directed in the order, and the order must protect a person who is neither a party nor a party's officer from significant expense resulting from compliance.

(3) ***Quashing or Modifying a Subpoena.***
(A) *When Required.* On timely motion, the court for the district where compliance is required must quash or modify a subpoena that:
(i) fails to allow a reasonable time to comply;
(ii) requires a person to comply beyond the geographical limits specified in Rule 45(c);
(iii) requires disclosure of privileged or other protected matter, if no exception or waiver applies; or
(iv) subjects a person to undue burden.
(B) *When Permitted.* To protect a person subject to or affected by a subpoena, the court for the district where compliance is required may, on motion, quash or modify the subpoena if it requires:
(i) disclosing a trade secret or other confidential research, development, or commercial information; or
(ii) disclosing an unretained expert's opinion or information that does not describe specific occurrences in dispute and results from the expert's study that was not requested by a party.
(C) *Specifying Conditions as an Alternative.* In the circumstances described in Rule 45(d)(3)(B), the court may, instead of quashing or modifying a subpoena, order appearance or production under specified conditions if the serving party:
(i) shows a substantial need for the testimony or material that cannot be otherwise met without undue hardship; and
(ii) ensures that the subpoenaed person will be reasonably compensated.

(e) Duties in Responding to a Subpoena.

(1) ***Producing Documents or Electronically Stored Information.*** These procedures apply to producing documents or electronically stored information:
(A) *Documents.* A person responding to a subpoena to produce documents must produce them as they are kept in the ordinary course of business or must organize and label them to correspond to the categories in the demand.
(B) *Form for Producing Electronically Stored Information Not Specified.* If a subpoena does not specify a form for producing electronically stored information, the person responding must produce it in a form or forms in which it is ordinarily maintained or in a reasonably usable form or forms.
(C) *Electronically Stored Information Produced in Only One Form.* The person responding need not produce the same electronically stored information in more than one form.
(D) *Inaccessible Electronically Stored Information.* The person responding need not provide discovery of electronically stored information from sources that the person identifies as not reasonably accessible because of undue burden or cost. On motion to compel discovery or for a protective order, the person responding must show that the information is not reasonably accessible because of undue burden or cost. If that showing is made, the court may nonetheless order discovery from such sources if the requesting party shows good cause, considering the limitations of Rule 26(b)(2)(C). The court may specify conditions for the discovery.

(2) ***Claiming Privilege or Protection.***
(A) *Information Withheld.* A person withholding subpoenaed information under a claim that it is privileged or subject to protection as trial-preparation material must:
(i) expressly make the claim; and
(ii) describe the nature of the withheld documents, communications, or tangible things in a manner that, without revealing information itself privileged or protected, will enable the parties to assess the claim.
(B) *Information Produced.* If information produced in response to a subpoena is subject to a claim of privilege or of protection as trial-preparation material, the person making the claim may notify any party that received the information of the claim and the basis for it. After being notified, a party must promptly return, sequester, or destroy the specified information and any copies it has; must not use or disclose the information until the claim is resolved; must take reasonable steps to retrieve the information if the party disclosed it before being notified; and may promptly present the information under seal to the court for the district where compliance is required for a determination of the claim. The person who produced the information must preserve the information until the claim is resolved.

(g) Contempt.
The court for the district where compliance is required—and also, after a motion is transferred, the issuing court—may hold in contempt a person who, having been served, fails without adequate excuse to obey the subpoena or an order related to it.

For access to subpoena materials, see Fed. R. Civ. P. 45(a) Committee Note (2013).

ATTACHMENT A

Redacted in its Entirety

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BEARBOX LLC and AUSTIN STORMS, Plaintiffs, v. LANCIUM LLC, MICHAEL T. MCNAMARA, and RAYMOND E. CLINE, JR., Defendants.	)	C.A. No. 21-534-MN

PROTECTIVE ORDER

Based on the agreement of the parties, and for good cause shown and pursuant to Rule 26(c) of the Federal Rules of Civil Procedure, IT IS HEREBY ORDERED as follows:

1. Scope. All materials produced or adduced in the course of discovery, including initial disclosures, responses to discovery requests, deposition testimony and exhibits, and information derived directly therefrom (hereinafter collectively "documents"), shall be subject to this Order concerning Confidential Information as defined below. This Order is subject to the Local Rules of this District and the Federal Rules of Civil Procedure on matters of procedure and calculation of time periods.

2. Confidential Information. As used in this Order, "Confidential Information" means information designated as "CONFIDENTIAL" by the producing party that it reasonably and in good faith believes contains or discloses confidential information that is non-public and that the producing party would not ordinarily disclose to third parties, or if disclosed, would require such parties to maintain in confidence. Information or documents that are available to the public may not be designated as Confidential.

3. Designation.

(a) A party may designate a document as Confidential Information for protection under this Order by placing or affixing the words "CONFIDENTIAL" on the document and on all copies in a manner that will not interfere with the legibility of the document. As used in this Order, "copies" includes electronic images, duplicates, extracts, summaries or descriptions that contain the Confidential Information. The marking "CONFIDENTIAL" shall be applied prior to or at the time the documents are produced or disclosed. Applying the marking "CONFIDENTIAL" to a document does not mean that the document has any status or protection by statute or otherwise except to the extent and for the purposes of this Order. Any copies that are made of any documents marked "CONFIDENTIAL" shall also be so marked, except that indices, electronic databases or lists of documents that do not contain substantial portions or images of the text of marked documents and do not otherwise disclose the substance of the Confidential Information are not required to be marked. To the extent that a document is produced in native format and is not capable of being marked with "CONFIDENTIAL," the party producing such material may inform the opposing party or parties that such information constitutes confidential information through a cover page to immediately precede the document or by other means mutually agreed to by the parties.

(b) The designation of a document as Confidential Information is a certification by an attorney and/or producing party that the document contains Confidential Information as defined in this Order.

4. Attorney's Eyes Only. Documents and things produced by a party and designated as "CONFIDENTIAL" pursuant to Paragraph 3 above and information contained therein which the producing party deems to be proprietary information and/or trade secrets and/or to comprise,

contain or disclose: technical information, including source code for computer programs; financial information concerning the producing party or its divisions, subsidiaries or product lines; prices; costs; profits or profit margins; lists of or including customers or potential customers' identities; business or product plans or strategies; technical information concerning products, market evaluations; lists of or including vendors' or suppliers' identities; product comparisons or evaluations; or other information of a highly proprietary, confidential nature may be further designated by the producing party as "ATTORNEY'S EYES ONLY" information by marking the initial page of the document if all pages contain such information, or by marking specific pages thereof, with the legend "CONFIDENTIAL - ATTORNEY'S EYES ONLY" in accordance with the procedure set forth in Paragraph 3 above.

5. To the extent CONFIDENTIAL or CONFIDENTIAL – ATTORNEY'S EYES ONLY information includes computer source code, source code-related specifications, and/or live data (that is, data as it exists residing in a database or databases), the producing party may designate such information as "RESTRICTED – CONFIDENTIAL SOURCE CODE." Access to such material will be by agreement of the parties, or, if the parties cannot agree, in accordance with the District of Delaware's DEFAULT STANDARD FOR ACCESS TO SOURCE CODE.

6. Depositions. Deposition testimony taken in this action shall be automatically treated as CONFIDENTIAL – ATTORNEYS' EYES ONLY information (as a default) for a period of fifteen (15) days after receipt of the final transcript (i.e., the non-rough version, but before being signed/proofed by the witness, if applicable) of the deposition from the court reporter. After the fifteen (15) day period, only such deposition testimony as was affirmatively designated on the record at the deposition or subsequently is specifically designated in writing by a party or non-party as CONFIDENTIAL or CONFIDENTIAL – ATTORNEYS' EYES ONLY shall be treated

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as such. For any deposition transcript in which any portion of the testimony has been designated as under this Order, the court reporter shall imprint the specific designation on each page of the original deposition transcript. In addition, each person authorized to receive a copy of a deposition transcript containing testimony designated as under this Order, shall imprint the specific designation on each page of all copies of the transcript so designated.

7. Protection of Confidential Material.

(a) General Protections. Confidential Information shall not be used or disclosed by the parties, counsel for the parties or any other persons identified in subparagraph (b) for any purpose whatsoever other than in this litigation, including any appeal thereof.

(b) Limited Third-Party Disclosures. The parties and counsel for the parties shall not disclose or permit the disclosure of any Confidential Information of an opposing party to any third person or entity except as set forth in subparagraphs (i)-(ix). Subject to these requirements, the following categories of persons may be allowed to review Confidential Information:

(i) Counsel. Any attorney at a law firm of counsel of record, and any employees of any such law firm such as law clerks, paralegals, secretaries, and clerical staff assisting counsel with this litigation. Outside counsel from firms of record who are not of record in the action shall, prior to accessing "CONFIDENTIAL - ATTORNEYS' EYES ONLY" information of an opposing party, complete the certification contained in Attachment A, Acknowledgment of Understanding and Agreement to Be Bound, and send the completed Acknowledgment to counsel for the other side, by email.

(ii) Parties. Individual parties and employees of a party, but only to the extent counsel determines in good faith that the employee's assistance is reasonably

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necessary to the conduct of the litigation in which the information is disclosed. For any document designated "CONFIDENTIAL - ATTORNEY'S EYES ONLY," a party (including but not limited to in-house counsel) may only review such document to the extent the opposing party has agreed to such review or the party was a clear author, sender or recipient of the document.

(iii) The Court and its personnel.

(iv) Court Reporters and Recorders. Court reporters and recorders engaged for depositions.

(v) Contractors. Those persons specifically engaged for the limited purpose of making copies of documents or organizing or processing documents, including outside vendors hired to process electronically stored documents.

(vi) Consultants and Experts. Consultants, investigators or experts consulted, retained or used by the parties or counsel for the parties to assist in the preparation and trial of this action, but only after such persons have completed the certification contained in Attachment A, Acknowledgment of Understanding and Agreement to Be Bound.

(vii) Witnesses. During their depositions or other testimony, witnesses in this action to whom disclosure is reasonably necessary. For any document designated "CONFIDENTIAL - ATTORNEY'S EYES ONLY," a witness may only review such document to the extent the opposing party has agreed to such review or the party was a clear author, sender or recipient of the document. Witnesses shall not retain a copy of documents containing Confidential Information, except witnesses may receive a copy of all exhibits marked at their depositions in connection with review of the transcripts. Pages

of transcribed deposition testimony or exhibits to depositions that are designated as Confidential Information pursuant to the process set out in this Order must be separately bound by the court reporter and may not be disclosed to anyone except as permitted under this Order.

(viii) Author or recipient. The author or recipient of the document (not including a person who only received the document in the course of litigation).

(ix) Others by Consent. Other persons only by written consent of the producing party or upon order of the Court and on such conditions as may be agreed or ordered.

(c) Control of Documents. Counsel for the parties shall make reasonable efforts to prevent unauthorized or inadvertent disclosure of Confidential Information. Counsel shall maintain the originals of the forms signed by persons acknowledging their obligations under this Order for a period of three (3) years after the termination of the case.

(d) Opposing counsel shall be notified at least 10 business days prior to disclosure to any person pursuant to paragraph 7(b)(vi). Such notice shall provide a reasonable description of the outside independent person to whom disclosure is sought sufficient to permit objection to be made (including an executed copy of Attachment A and a curriculum vitae, which includes the consultant's or expert's name, current business affiliations and addresses, and any known present or former relationships between the consultant or expert and any of the parties). If a party objects in writing to such disclosure within 10 business days after receipt of notice, no disclosure shall be made until the party seeking disclosure obtains the prior approval of the Court or the objecting party.

8. Prosecution Bar. Absent written consent from the producing party, any individual who receives access to an opposing party's "CONFIDENTIAL – ATTORNEYS' EYES ONLY" information shall not be involved in the prosecution of patents or patent applications relating to the subject matter claimed in U.S. Patent No. 10,608,433 ("the '433 Patent"), including without limitation any patent or application claiming priority to or otherwise related to the '433 Patent, before any foreign or domestic agency, including the United States Patent and Trademark Office ("the Patent Office"). For purposes of this paragraph, "prosecution" includes directly or indirectly drafting, amending, advising, or otherwise affecting the scope or maintenance of patent claims. To avoid any doubt, "prosecution" as used in this paragraph does not include representing a party either challenging or defending a patent before a domestic or foreign agency (including, but not limited to, a reissue protest, ex parte reexamination or *inter partes* reexamination), but this provision would preclude such individual from advising directly or indirectly on any amendments to the claims of the patent being challenged in such proceedings. This Prosecution Bar shall begin when access to the opposing party's "CONFIDENTIAL – ATTORNEYS' EYES ONLY" information is first received by the affected individual and shall end two (2) years after final termination of this action.

9. Inadvertent Failure to Designate. An inadvertent failure to designate a document as Confidential Information does not, standing alone, waive the right to so designate the document. If a party designates a document as Confidential Information after it was initially produced, the receiving party, on notification of the designation, must make a reasonable effort to assure that the document is treated in accordance with the provisions of this Order. No party shall be found to have violated this Order for failing to maintain the confidentiality of material during a time when that material has not been designated Confidential Information, even where the failure to so

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designate was inadvertent and where the material is subsequently designated Confidential Information.

10. Filing of Confidential Information. This Order does not, by itself, authorize the filing of any document under seal. Any party wishing to file a document designated as Confidential Information in connection with a motion, brief or other submission to the Court must comply with LR 26.2.

11. No Greater Protection of Specific Documents. Except on privilege grounds not addressed by this Order, no party may withhold information from discovery on the ground that it requires protection greater than that afforded by this Order unless the party moves for an order providing such special protection.

12. Challenges by a Party to Designation as Confidential Information. The designation of any material or document as Confidential Information is subject to challenge by any party. The following procedure shall apply to any such challenge:

(a) Meet and Confer. A party challenging the designation of Confidential Information must do so in good faith and must begin the process by conferring directly with counsel for the designating party. In conferring, the challenging party must explain the basis for its belief that the confidentiality designation was not proper and must give the designating party an opportunity to review the designated material, to reconsider the designation, and, if no change in designation is offered, to explain the basis for the designation. The designating party must respond to the challenge within five (5) business days of the meet and confer.

(b) Judicial Intervention. A party that elects to challenge a confidentiality designation may file and serve a motion that identifies the challenged material and sets forth in detail the basis for the challenge. Each such motion must be accompanied by a competent

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declaration that affirms that the movant has complied with the meet and confer requirements of this procedure. The burden of persuasion in any such challenge proceeding shall be on the designating party. Until the Court rules on the challenge, the designation will remain in full force and effect, and all parties shall continue to treat the materials as Confidential Information under the terms of this Order.

13. Action by the Court. Applications to the Court for an order relating to materials or documents designated Confidential Information shall be by motion. Nothing in this Order or any action or agreement of a party under this Order limits the Court's power to make orders concerning the disclosure of documents produced in discovery or at trial.

14. Use of Confidential Documents or Information at Trial. Nothing in this Order shall be construed to prohibit the use of any document, material or information at any trial or hearing. A party that intends to present, or that anticipates that another party may present, Confidential Information at a hearing or trial shall bring that issue to the Court's and parties' attention by motion or in a pretrial memorandum without disclosing the Confidential Information. The Court may thereafter make such orders as are necessary to govern the use of such documents or information at a hearing or trial.

15. Other Proceedings. By entering this Order and limiting the disclosure of information in this case, the Court does not intend to preclude another court from finding that information may be relevant and subject to disclosure in another case. Any person or party subject to this Order who becomes subject to a motion to disclose another party's information designated "CONFIDENTIAL," "CONFIDENTIAL - ATTORNEYS' EYES ONLY," or "RESTRICTED – CONFIDENTIAL SOURCE CODE" pursuant to this Order shall promptly notify that party of the

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motion so that the party may have an opportunity to appear and be heard on whether that information should be disclosed.

16. Confidential Information Subpoenaed or Ordered Produced in Other Litigation.

(a) If a receiving party is served with a subpoena or an order issued in other litigation that would compel disclosure of any material or document designated in this action as Confidential Information, the receiving party must so notify the designating party, in writing, immediately and in no event more than three court days after receiving the subpoena or order. Such notification must include a copy of the subpoena or court order.

(b) The receiving party also must immediately inform in writing the party who caused the subpoena or order to issue in the other litigation that some or all of the material covered by the subpoena or order is the subject of this Order. In addition, the receiving party must deliver a copy of this Order promptly to the party in the other action that caused the subpoena to issue.

(c) The purpose of imposing these duties is to alert the interested persons to the existence of this Order and to afford the designating party in this case an opportunity to try to protect its Confidential Information in the court from which the subpoena or order is issued. The designating party shall bear the burden and the expense of seeking protection in that court of its Confidential Information, and nothing in these provisions should be construed as authorizing or encouraging a receiving party in this action to disobey a lawful directive from another court. The obligations set forth in this paragraph remain in effect while the party has in its possession, custody or control Confidential Information by the other party to this case.

17. Obligations on Conclusion of Litigation.

(a) Order Continues in Force. Unless otherwise agreed or ordered, this Order shall remain in force after dismissal or entry of final judgment not subject to further appeal.

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(b) Obligations at Conclusion of Litigation. Within forty-five (45) days after dismissal or entry of final judgment not subject to further appeal, all Confidential Information and documents marked "CONFIDENTIAL" under this Order, including copies as defined in Paragraph 3(a), shall be returned to the producing party unless: (1) the document has been offered into evidence or filed without restriction as to disclosure; or (2) the receiving party destroys the producing party's Confidential Information and certifies in writing to the producing party that it has done so.

(c) Retention of Work Product and one set of Filed Documents. Notwithstanding the above requirements to return or destroy documents, counsel may retain (1) attorney work product, including an index that refers or relates to designated Confidential Information so long as that work product does not duplicate verbatim substantial portions of Confidential Information, and (2) one complete set of all documents filed with the Court including those filed under seal. Any retained Confidential Information shall continue to be protected under this Order. An attorney may use his or her work product in subsequent litigation, provided that its use does not disclose or use Confidential Information.

(d) Deletion of Documents filed under Seal from Electronic Case Filing (ECF) System. Filings under seal shall be deleted from the ECF system only upon order of the Court.

18. Order Subject to Modification. This Order shall be subject to modification by the Court on its own initiative or on motion of a party or any other person with standing concerning the subject matter.

19. No Prior Judicial Determination. This Order is entered based on the representations and agreements of the parties and for the purpose of facilitating discovery. Nothing herein shall be construed or presented as a judicial determination that any document or material designated

Confidential Information by counsel or the parties is entitled to protection under Rule 26(c) of the Federal Rules of Civil Procedure or otherwise until such time as the Court may rule on a specific document or issue.

20. Production by Non-parties. The existence of this Order shall be disclosed to any non-party producing documents or information in this litigation who may reasonably be expected to desire confidential treatment of such information, including any non-party subpoenaed in connection with this litigation. Such non-parties may avail themselves of the protections of this Order through Attachment A ("Acknowledgment and Agreement to Be Bound"). If a party chooses to produce documents without signing Attachment A, the documents produced will not be subject to this Agreement.

21. Persons Bound. This Order shall take effect when entered and shall be binding upon all counsel of record and their law firms, the parties and persons made subject to this Order by its terms.

22. Pursuant to Fed. R. Evid. 502(d), the disclosure of documents or materials subject to the attorney-client privilege, work-product immunity, or any other applicable privilege or immunity shall not constitute a waiver, in whole or in part, of the privilege or immunity in this, or any other federal, state, or administrative, litigation or proceeding, either as to the specific information disclosed or as to any other information relating thereto or to the same or related subject matter. This protection against waiver of privilege or immunity applies at all times (i.e., it applies whether disclosure occurs before, during, or after productions are made in discovery). If information is produced in discovery that is subject to a claim of privilege, work-product immunity, or any other applicable privilege or immunity, the party making the claim shall notify any party that received the information of the claim and the basis for it within five (5) business

days of its discovery, and, within five (5) business days of receipt of such notice, the notified party or parties (regardless of any disagreement regarding the proper designation of the document) shall return, delete, or destroy the document forthwith, as well as any and all copies and shall certify to that effect; except that if a party intends to challenge an assertion of privilege or immunity, it shall promptly notify the party asserting privilege or immunity and thereafter may retain one copy of each document that is subject to the challenged claim of privilege or immunity for the sole purpose of pursuing the challenge. Challenges to the designation of information as privileged, attorney work product, or immune shall be made in the same manner as challenges to the designation of Confidential Information set forth in paragraph 12 of this Order.

SO ORDERED,

Dated: September 10, 2021

Christopher J. Burke

The Honorable Christopher J. Burke
United States Magistrate Judge

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BEARBOX LLC and AUSTIN STORMS, Plaintiffs, v. LANCIUM LLC, MICHAEL T. MCNAMARA, and RAYMOND E. CLINE, JR., Defendants.	)	C.A. No. 21-534-MN

ATTACHMENT A
Acknowledgment of Understanding and Agreement to Be Bound

I, ____, declare as follows:

1. I am currently employed by or am a partner or owner of the following company or firm:

____;

at the following address: ____

____;

and my title is ____.

2. My current occupation is:

____.

3. I have received a copy of the Protective Order in this action. I have carefully read and understand the provisions of the Protective Order.

4. I will comply with all of the provisions of the Protective Order. I will hold in confidence, will not disclose to anyone not qualified under the Protective Order, and will use only for purposes of this action any information designated as "CONFIDENTIAL,"

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"CONFIDENTIAL - ATTORNEYS' EYES ONLY," or "RESTRICTED – CONFIDENTIAL SOURCE CODE" that is disclosed to me.

4. Promptly upon termination of this action, I will return all documents and things designated as "CONFIDENTIAL," "CONFIDENTIAL - ATTORNEYS' EYES ONLY," or "RESTRICTED – CONFIDENTIAL SOURCE CODE" that came into my possession, and all documents and things that I have prepared relating thereto, to outside counsel of record.

5. I hereby submit to the jurisdiction of this Court for the purpose of enforcement of the Protective Order in this action.

I declare under penalty of perjury that the foregoing is true and correct.

Signature:

____

Date:

____

EXHIBIT 1

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BEARBOX LLC and AUSTIN STORMS,	)	
Plaintiffs,	)	
v.	)	C.A. No. 21-534-MN
LANCIUM LLC, MICHAEL T. MCNAMARA, and RAYMOND E. CLINE, JR.	)	**JURY TRIAL DEMANDED**
Defendants.	)	

AMENDED COMPLAINT

Plaintiffs BearBox LLC ("BearBox") and Austin Storms (collectively, "Plaintiffs") bring this action against Lancium LLC ("Lancium"), Michael T. McNamara, and Raymond E. Cline, Jr. (collectively "Defendants") to correct the inventorship of U.S. Patent No. 10,608,433 (the "'433 Patent") and to recover damages, injunctive relief, declaratory relief, and other remedies for Defendants' wrongful actions to obtain, misuse, disclose, and claim as their own Plaintiffs' proprietary cryptocurrency mining technology. Plaintiffs further allege as follows:

INTRODUCTION

1. This case is about the Defendants' theft of inventions that rightfully belong to Plaintiffs.

2. Plaintiffs developed proprietary technology relating to cryptocurrency mining systems (the "BearBox Technology"). By way of background, the BearBox Technology generally relates to an energy-efficient cryptocurrency mining system and related methods that reduce the inefficiency and environmental impact of energy-expensive mining operations by better utilizing available energy resources to increase stability of the energy grid, minimize a

mining operation's impact on peak-demand, and also alleviate energy over-supply conditions. The BearBox Technology can be used to mine cryptocurrency, such as Bitcoin.

3. The Defendants induced the Plaintiffs to disclose the BearBox Technology to them under the guise of a possible business deal between Defendants and Plaintiffs to jointly commercialize the BearBox Technology. Before disclosing the BearBox Technology to Defendants, Plaintiffs obtained assurances of confidentiality from Defendants.

4. The Defendants stole the BearBox Technology from Plaintiffs by converting and misappropriating it and claiming it as their own. Defendants filed a U.S. patent application that wrongfully disclosed the BearBox Technology to the U.S. Patent and Trademark Office and ultimately to the public. The claimed subject matter of the '433 Patent falls fully within the scope of the BearBox Technology. And by obtaining the '433 Patent with claims directed to the BearBox Technology, the Defendants have wrongfully obtained a patent covering the BearBox Technology and wrongfully claimed the BearBox Technology as their own.

5. Plaintiffs bring this action to correct the named inventors on the '433 Patent. The inventions claimed in the '433 Patent are inventions conceived by Storms, founder and president of BearBox.

PARTIES

6. Plaintiff BearBox LLC ("BearBox") is a limited liability company organized and existing under the laws of Louisiana with its principal place of business at 4422 Highway 22, Mandeville, Louisiana 70471.

7. Plaintiff Austin Storms is an individual residing in Mandeville, Louisiana.

8. On information and belief, Defendant Lancium is a Delaware limited liability company with its principal place of business at 6006 Thomas Rd, Houston, Texas 77041. On

information and belief, Lancium has a registered agent capable of accepting service in this district, Harvard Business Services, Inc. with a place of business at 16192 Coastal Highway, Lewes, DE 19958.

9. On information and belief, Defendant Michael T. McNamara is the Chief Executive Officer and a founder of Lancium and resides in Newport Beach, California. Defendant McNamara is named as a purported inventor on the face of the ’433 Patent.

10. On information and belief, Defendant Raymond E. Cline, Jr. is the Chief Computing Officer of Lancium and resides in Houston, Texas. Defendant Cline is named as a purported inventor on the face of the ’433 Patent.

JURISDICTION

11. This is an action seeking correction of the named inventors of a United States patent under 35 U.S.C. § 256. As such, this action arises under the laws of the United States.

12. This Court has exclusive subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a) because the matter arises under an Act of Congress relating to patents, specifically 35 U.S.C. § 256.

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13. The Court has supplemental jurisdiction under 28 U.S.C. § 1367 over all asserted claims under state law because those claims are so related to the claims in this action that arise under federal law that they form part of the same case or controversy.

14. The Court also has jurisdiction pursuant to 28 U.S.C. § 1332, as complete diversity of citizenship exists among the parties, and the amount in controversy exceeds $75,000. Plaintiff BearBox is a citizen of the State of Louisiana because it is organized under the laws of the State of Louisiana and has its principal place of business in the State of Louisiana. Plaintiff

Storms is a citizen of the State of Louisiana because he resides in the State of Louisiana. In contrast, none of the Defendants are citizens of the State of Louisiana. Defendant Lancium is a citizen of the States of Delaware and Texas because it is organized under the laws of the State of Delaware and has its principal place of business in the State of Texas. Defendant McNamara is a citizen of the State of California because he resides in the State of California. Defendant Cline is a citizen of the State of Texas because he resides in the State of Texas. Therefore, because the Plaintiffs are both citizens of the State of Louisiana (and no other states) for purposes of diversity jurisdiction, and none of the Defendants are citizens of the State of Louisiana, complete diversity exists among the parties.

15. This Court has general personal jurisdiction over Lancium because it is organized under the laws of the State of Delaware and because it maintains an ongoing presence in this District at least through its registered agent.

16. This Court has specific personal jurisdiction over each of Defendants McNamara and Cline at least under Title 6 of the Delaware Code, § 18-109(a).

17. On information and belief, Defendant McNamara is the Chief Executive Officer of Lancium. On information and belief, as the Chief Executive Offer, McNamara participates materially in the management of Lancium, has control and/or decision-making authority over Lancium, and is a key individual who takes actions on behalf of Lancium.

18. McNamara is a necessary or proper party to this action because he has a legal interest in the dispute that is separate from the interests of Lancium and because Plaintiffs' claims against him arise out of the same facts and occurrences as the claims against Lancium. Accordingly, it serves judicial economy to consider the claims against Lancium and Defendant

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McNamara together. Plaintiffs' claims against Defendant McNamara arise out of his exercise of his powers as Chief Executive Officer of Lancium.

19. On information and belief, Defendant Cline is the Chief Computing Officer of Lancium. On information and belief, as the Chief Computing Officer, Cline participates materially in the management of Lancium, has control and/or decision-making authority over Lancium, and is a key individual who takes actions on behalf of Lancium.

20. Cline is a necessary or proper party to this action because he has a legal interest in the dispute that is separate from Lancium's interest and because Plaintiffs' claims against him arise out of the same facts and occurrences as the claim against Lancium. Accordingly, it serves judicial economy to consider the claims against Lancium and Defendant Cline together. Plaintiffs' claims against Defendant Cline arise out of his exercise of his powers as Chief Computing Officer of Lancium.

21. The actions of Defendants McNamara and Cline establish sufficient minimum contacts with Delaware under Delaware law and the United States Constitution to give this Court personal jurisdiction over each of them.

22. As described below, each Defendant has committed acts giving rise to this action.

VENUE

23. Venue is proper in this District under 28 U.S.C. § 1391(b)(3) because there is no district in which an action may otherwise be brought as provided in § 1391(b) and Defendant Lancium is subject to the Court's personal jurisdiction with respect to this action.

PLAINTIFFS' PROPRIETARY CRYPTOCURRENCY MINING TECHNOLOGY

24. As of 2018, the amount of energy required to process computer algorithms to mine cryptocurrencies like Bitcoin was three times greater than the energy required to physically mine gold. Conventional mining of "copper, gold, platinum, and rare earth oxides are 4, 5, 7, and 9 megajoules to generate one U.S. dollars," while "it costs an average of 17 megajoules to mine $1 worth of bitcoin."[1] The large amount of energy required to mine cryptocurrencies can make such mining financially prohibitive, and even when financially lucrative, the large energy requirements make cryptocurrency mining harmful to the global environment, with studies showing carbon dioxide emissions from cryptocurrency mining "single-handedly rais[ing] global temperatures by 2 degrees by 2023." *Id*.

25. At the same time, some forms of electrical power generation are terribly inefficient. When producers of electrical power are unable to quickly adjust their operations in response to dynamically changing grid conditions, these producers frequently sell power at low or even negative prices until demand and market prices increase.

26. Because cryptocurrency mining is a computationally demanding process, it requires significant energy. As a result, industrial-scale cryptocurrency mining places a large energy burden on the power grid, driving demand and costs as well as increasing the likelihood of grid component failure.

27. In late 2018 and early 2019, Austin Storms sought to address these problems by developing energy-efficient cryptocurrency mining systems and methods that reduce the environmental impact of energy-intensive mining operations. Storms conceived of a system that

[1] https://www.marketwatch.com/story/mining-bitcoin-is-3-times-more-expensive-than-mining-gold-research-paper-finds-2018-11-06

better uses available energy resources to increase the stability of the energy grid, minimize a mining operation's impact on peak-demand, and alleviate energy over supply conditions, all while decreasing the overall energy costs of the mining operation and increasing its profitability.

28. Austin Storms conceived of and developed the BearBox Technology. Storms is the president and founder of BearBox. The BearBox Technology includes hardware and software components. Structurally, the BearBox Technology includes a housing for a plurality of miners (such as ASICs, graphics cards, or the like) under the direction of a smart controller(s).

29. The smart controller monitors various external factors, such as current and expected energy demand and pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the system may determine whether conditions are appropriate to mine cryptocurrency and, if so, subsequently mines the cryptocurrency. Optionally, the system also includes other components for cooling, air-filtration, and related features.

30. In the BearBox Technology, a controller (such as a power distribution unit, network interface, or the like) monitors various external factors, such as current and expected energy demand/pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the controller(s) determines appropriate times to mine cryptocurrency in accordance with a desired performance strategy (for example, profitability thresholds). At the appropriate times, the controller initiates mining, for example, by powering on the miners.

DEFENDANTS WRONGFULLY CLAIM THE BEARBOX TECHNOLOGY AS THEIR OWN

31. In May 2019, Storms attended the Fidelity FCAT Mining Summit in Boston, Massachusetts on behalf of BearBox to promote the BearBox Technology and seek potential customers for his revolutionary system.

32. While at the conference, Storms met Defendant McNamara. Defendant McNamara showed immediate interest in the BearBox Technology. Under the rouse of a potential business relationship, McNamara pumped Storms for details about the BearBox Technology over the course of several exchanges, which included conversations, emails, and text messages about the BearBox Technology. Storms took McNamara to dinner where McNamara continued to pump Storms for details about the BearBox Technology. At all times before and during Storms's disclosure of this information, Storms told McNamara that the BearBox Technology was confidential, and Storms relied on McNamara's good faith assurances that he would keep confidential the information he received from Storms about the BearBox Technology.

33. Following the conference, McNamara continued to press Storms for additional details about the BearBox Technology via text messaging and email. Again relying on Defendant McNamara's assurances of confidentiality, Storms provided annotated system diagrams, component specifications, and modeled data sets to mimic real-world Bitcoin and energy prices. Storms included express confidentiality notices in his communications with Defendant McNamara.

34. After Storms disclosed the BearBox Technology to McNamara, McNamara abruptly ended all communications with Storms.

35. Storms last communicated with McNamara on May 9, 2019 via e-mail, and after sending that message, Storms did not hear from McNamara again.

36. At that time, Storms understood that McNamara was not interested in investing in the BearBox Technology. He had no reason to suspect that McNamara would steal the BearBox Technology and claim it as his own.

37. On information and belief, Defendants filed U.S. provisional patent application No. 62/927,119 on October 28, 2019, naming Defendants McNamara and Cline as the purported sole joint inventors of the inventions disclosed in the application.

38. In addition to falsely claiming to be the inventors of the inventions disclosed in the application, Defendants wrongfully disclosed, without authorization, the confidential BearBox Technology to the United States Patent and Trademark Office.

39. Likewise, on December 4, 2019, Defendants filed U.S. Patent Application Serial No. 16/702,931, once again naming Defendants McNamara and Cline as the purported sole joint inventors of the inventions disclosed in the application.

40. The ’433 Patent issued on March 31, 2020 naming Defendants McNamara and Cline as the sole purported inventors on the face of the patent. A true and correct copy of the ’433 Patent is attached hereto as Exhibit A.

41. The inventions claimed in the ’433 patent fall within the scope of the BearBox Technology, yet Defendants falsely identified themselves as the inventors of the claimed inventions, when, in fact, Storms is the sole inventor of the claimed inventions.

42. On information and belief, McNamara and Cline assigned their purported rights in the ’433 patent to Lancium. On information and belief, at all times, Lancium was aware that

McNamara and Cline, both officers of Lancium, were not the rightful inventors of the BearBox Technology disclosed in the patent and the inventions claimed in the patent.

43. Defendants McNamara and Cline each submitted signed declarations falsely swearing that they were "an original joint inventor" of the claimed subject matter . A true and correct copy of Defendant McNamara's and Defendant Cline's declarations are attached as Exhibit B.

44. On August 14, 2020, Lancium filed a lawsuit in the U.S. District Court for the Western District of Texas against Layer1 Technologies, Inc. ("Layer1") asserting that Layer1 infringes the '433 patent. That case is captioned *Lancium LLC v. Layer1 Technologies, Inc.*, Case No. 6:20-cv-739 (W.D. Texas) (the "Layer1 Lawsuit").

45. As part of the Layer1 Lawsuit, Defendants falsely asserted that McNamara and Cline are the sole inventors of the inventions claimed in the '433 patent.

46. Plaintiffs became aware of Defendants' wrongful use of the BearBox Technology on or about August 17, 2020, when they learned about the Layer1 Lawsuit through a press release dated August 14, 2020, posted by Lancium on PRNewswire. That press release is available at the following URL: https://www.prnewswire.com/news-releases/controllable-load-resource-clr-market-leader-lancium-files-patent-infringement-lawsuit-against-layer1-301112687.html.

47. Before seeing the August 14, 2020 press release, Plaintiffs were unaware of Defendants' wrongful use of the BearBox Technology and was unaware of the '433 patent.

48. On March 5, 2021, Lancium and Layer1 entered a Stipulation to Dismiss with Prejudice in the Layer1 Lawsuit. According to the stipulation, the parties had entered a Settlement Agreement to resolve the Layer1 Lawsuit.

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49. According to a press release issued by Lancium on March 8, 2021, Lancium and Layer 1 "have entered into a mutually beneficial partnership. Layer1 has licensed Lancium's intellectual property and Lancium will provide Smart Response™ software and services to Layer1." The press release is available at the following URL: https://www.prnewswire.com/news-releases/lancium-and-layer1-settle-patent-infringement-suit-301242602.html

50. On information and belief, as part of the Settlement Agreement between Lancium and Layer1 to settle the Layer1 Lawsuit, Lancium received and continues to receive valuable consideration from Layer1, all of which rightly belongs to Plaintiffs, the rightful owners of the inventions claimed in the '433 Patent.

COUNT I
CORRECTION OF INVENTORSHIP FOR THE '433 PATENT: AUSTIN STORMS AS SOLE INVENTOR

51. Plaintiffs incorporate the above paragraphs by reference.

52. Storms is the sole inventor of the subject matter claimed in the '433 Patent.

53. Through omission, inadvertence, and/or error, Storms was not listed as an inventor on the '433 patent and the currently listed inventors on the '433 patent were improperly listed. The omission, inadvertence, and/or error occurred without any deceptive intent on the part of Storms or BearBox.

54. Unless Defendants Lancium, McNamara, and Cline are enjoined from asserting that McNamara and Cline are the sole inventors of the '433 Patent in violation of U.S. federal patent laws, Plaintiffs will suffer irreparable injury. Plaintiffs have no adequate remedy at law.

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COUNT II
IN THE ALTERNATIVE, CORRECTION OF INVENTORSHIP FOR THE '433 PATENT: AUSTIN STORMS AS JOINT INVENTOR WITH THE CURRENTLY NAMED INVENTORS

55. Plaintiffs incorporates the above paragraphs by reference.

56. In the alternative, Storms is a joint inventor of the subject matter claimed in the '433 Patent and should be added to the individuals currently named as inventors on the '433 Patent.

57. Through omission, inadvertence, and/or error, Storms was not listed as an inventor on the '433 patent and the currently listed inventors on the '433 patent were improperly listed. The omission, inadvertence, and/or error occurred without any deceptive intent on the part of Storms.

58. Unless Defendants Lancium, McNamara, and Cline are enjoined from asserting that McNamara and Cline are the sole inventors of the '433 Patent in violation of U.S. federal patent laws, Plaintiffs will suffer irreparable injury. Plaintiffs have no adequate remedy at law.

COUNT III
CONVERSION BY LANCIUM, MCNAMARA, AND CLINE

59. Plaintiffs incorporates the above paragraphs by reference.

60. Austin Storms, in his capacity as founder and President of BearBox, conceived, developed, and reduced to practice the BearBox Technology. Plaintiffs own the BearBox Technology, related know-how, and related intellectual property. Plaintiffs owned this property during all relevant time periods in this suit. Information on the BearBox Technology was provided to Defendants solely for the purposes of evaluation for a potential business relationship and under strict confidentiality obligations.

61. Defendants assumed dominion and control over the BearBox Technology by claiming it as their own in the ’433 patent. Through their wrongful conduct in obtaining the ’433 Patent and claiming the BearBox Technology as their own, the Defendants have wrongfully obtained the purported ability to exclude Plaintiffs and others from using the BearBox Technology. This constitutes unauthorized and unlawful conversion by Defendants.

62. As a result of Defendants’ wrongful actions, Plaintiffs will suffer imminent and irreparable damages in an amount to be proven at trial. In particular, Plaintiffs have been damaged by losing valuable intellectual property from which Plaintiffs would have derived substantial revenue via licensing and/or selling patented products.

COUNT IV
UNJUST ENRICHMENT BY LANCIUM, MCNAMARA, AND CLINE

63. Plaintiffs incorporate the above paragraphs by reference.

64. Plaintiffs conferred a benefit on Defendants by providing them valuable intellectual property about cryptocurrency mining systems and related confidential information and materials under the boundaries of a potential collaboration between BearBox and Lancium.

65. Defendants accepted that cryptocurrency mining intellectual property and, indeed, continuously asked Storms to provide more information and materials, having recognized the benefit that Defendants received by having access to the BearBox Technology.

66. Defendants accepted and retained the BearBox Technology, and used it to their own advantage, at Plaintiffs’ expense.

67. Defendants have been and continue to be unjustly enriched by profiting from their wrongful conduct. In particular, Defendants have unlawfully used Plaintiffs’ property by asserting inventorship over the BearBox Technology, and deriving an unjust benefit from

exploiting Storms's cryptocurrency mining inventions. It would be inequitable for Defendants to retain these benefits under these circumstances.

68. Plaintiffs have incurred, and continue to incur, detriment in the form of loss of money and property as a result of Defendants' wrongful use of Plaintiffs' intellectual property, including the right to any patent based on their own intellectual property. The intellectual property, including the right to any patents based on Plaintiffs' intellectual property and to any patent documents (including assignment documents), U.S. and foreign, are unique and there is no adequate remedy at law.

69. The harm to Plaintiffs is continuous, substantial, and irreparable.

COUNT V
NEGLIGENT MISREPRESENTATION BY LANCIUM AND MCNAMARA

70. Plaintiffs incorporate the above paragraphs by reference.

71. In connection with the potential work involving cryptocurrency mining systems and related methods, Storms told Defendant McNamara that the cryptocurrency mining systems and related methods were proprietary to Plaintiffs and not to be used or shared outside of Lancium. Defendant McNamara gave his word that he would abide by this confidentiality. On information and belief, Defendant McNamara agreed to keep the BearBox Technology confidential despite later recklessly incorporating the BearBox Technology into his own patent applications and swearing, as recently as December 4, 2019, that he is an inventor of the BearBox Technology. Storms relied on Defendant McNamara's assurances of confidentiality and continued to share details about the BearBox Technology with Defendants.

72. If Plaintiffs had known that Defendants would secretly incorporate the BearBox Technology into Defendants' own patent applications to claim them as Defendants' intellectual

property, Plaintiffs would not have continued working with and sharing intellectual property with Defendants.

73. Plaintiffs suffered a pecuniary loss based on this reliance including the loss of potential patent rights, and the costs of Plaintiffs' know-how converted under the guise of a potential business relationship.

JURY DEMAND

74. Under Rule 38(b) of the Federal Rules of Civil Procedure, Plaintiffs respectfully demand a trial by jury on all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, BearBox respectfully requests the following relief:

A. An order that the Director of the United States Patent and Trademark Office correct the inventorship of the '433 Patent to name Austin Storms as the sole inventor, or, in the alternative, as a joint inventor to one or both of the individuals currently listed as inventors on the '433 Patent;

B. Alternatively, an order that Defendants sign the requisite documents to correct inventorship of the '433 Patent to name Austin Storms as the sole inventor, or, in the alternative, as a joint inventor to one or both of the individuals currently listed as inventors on the '433 Patent;

C. A declaration that Austin Storms is the sole inventor, or, in the alternative, is a joint inventor to one or both of the individuals currently listed as inventors on the '433 Patent;

D. A preliminary and a permanent injunction enjoining Defendants Lancium, McNamara, and Cline from asserting that McNamara or Cline are inventors of the '433 Patent in violation of the United States federal patent laws;

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E. An order that Defendants immediately transfer to Plaintiffs all right, title, and interest in all information, patent applications, patents, technology, products, and other materials in the possession, custody, or control of Defendants that wrongfully constitute, contain, were based on, and/or derived in whole or in part from the use of Plaintiffs' intellectual property;

F. An order for a constructive trust over all information, patent applications, patents, technology, products, and other materials in the possession, custody, or control of Defendants that wrongfully constitute, contain, were based on, and/or derived in whole or in part from the use of Plaintiffs' intellectual property;

G. Financial relief including damages, consequential damages, disgorgement of Defendants' ill-gotten profits, Defendants' unjust enrichment, reasonable royalty damages, lost profits damages, reliance damages, and/or all other appropriate financial relief, all in an amount to be determined at trial, with interest;

H. An award of the amount by which Defendants have been unjustly enriched by their actions set forth in this Complaint and their purported ownership of patents covering Plaintiffs' intellectual property;

I. A finding that this is an exceptional case warranting imposition of attorney fees against Defendants and an award to Plaintiffs of its reasonable costs and attorney fees incurred in bringing this action pursuant to 35 U.S.C. § 285; and

J. An award of such further relief at law or in equity, such as preliminary and/or permanent injunctive relief, as the Court deems just and proper.

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Dated: May 24, 2021

EXHIBIT A

US010608433B1

(12) **United States Patent**
McNamara et al.

(10) **Patent No.: US 10,608,433 B1**
(45) **Date of Patent: Mar. 31, 2020**

(54) **METHODS AND SYSTEMS FOR ADJUSTING POWER CONSUMPTION BASED ON A FIXED-DURATION POWER OPTION AGREEMENT**

(71) Applicant: **Lancium LLC**, Houston, TX (US)

(72) Inventors: **Michael T. McNamara**, Newport Beach, CA (US); **Raymond E. Cline, Jr.**, Houston, TX (US)

(73) Assignee: **Lancium LLC**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/702,931**

(22) Filed: **Dec. 4, 2019**

Related U.S. Application Data

(60) Provisional application No. 62/927,119, filed on Oct. 28, 2019.

(51) **Int. Cl.**
H02J 3/14 (2006.01)
H02J 3/00 (2006.01)
G06F 1/3203 (2019.01)

(52) **U.S. Cl.**
CPC ***H02J 3/14*** (2013.01); ***G06F 1/3203*** (2013.01); ***H02J 3/008*** (2013.01)

(58) **Field of Classification Search**
CPC H02J 3/14; H02J 3/008; G06F 1/3203
See application file for complete search history.

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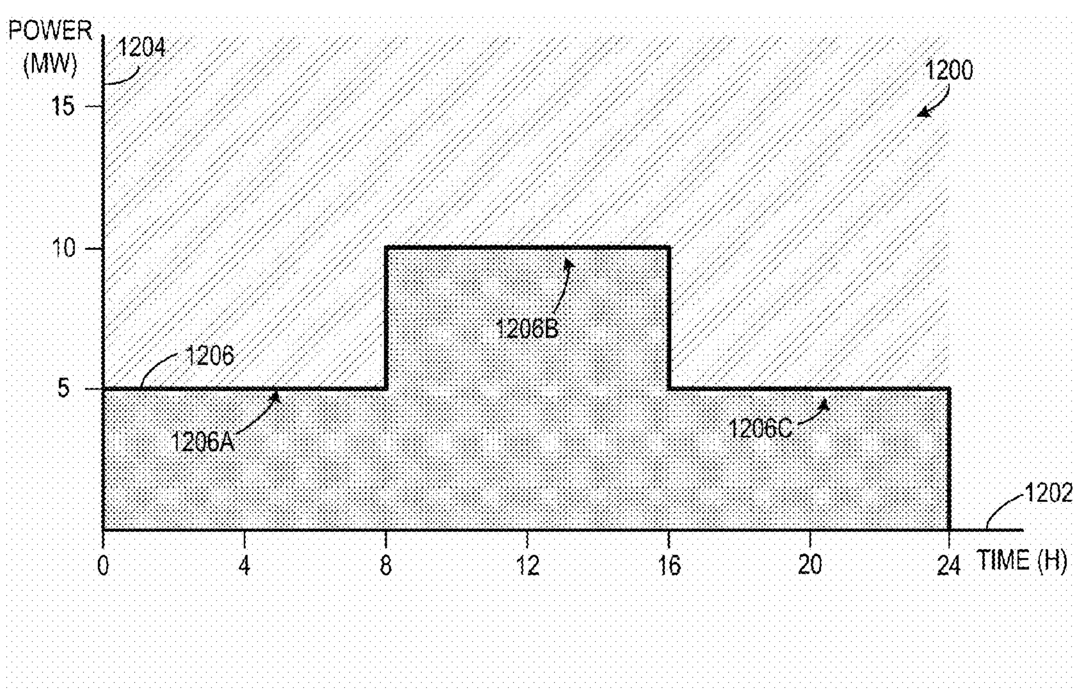
Primary Examiner — Christopher E. Everett
(74) *Attorney, Agent, or Firm* — McDonnell Boehnen Hulbert & Berghoff LLP

(57) **ABSTRACT**

Examples relate to adjusting load power consumption based on a power option agreement. A computing system may receive power option data that is based on a power option agreement and specify minimum power thresholds associated with time intervals. The computing system may determine a performance strategy for a load (e.g., set of computing systems) based on a combination of the power option data and one or more monitored conditions. The performance strategy may specify a power consumption target for the load for each time interval such that each power consumption target is equal to or greater than the minimum power threshold associated with each time interval. The computing system may provide instructions the set of computing systems to perform one or more computational operations based on the performance strategy.

20 Claims, 16 Drawing Sheets



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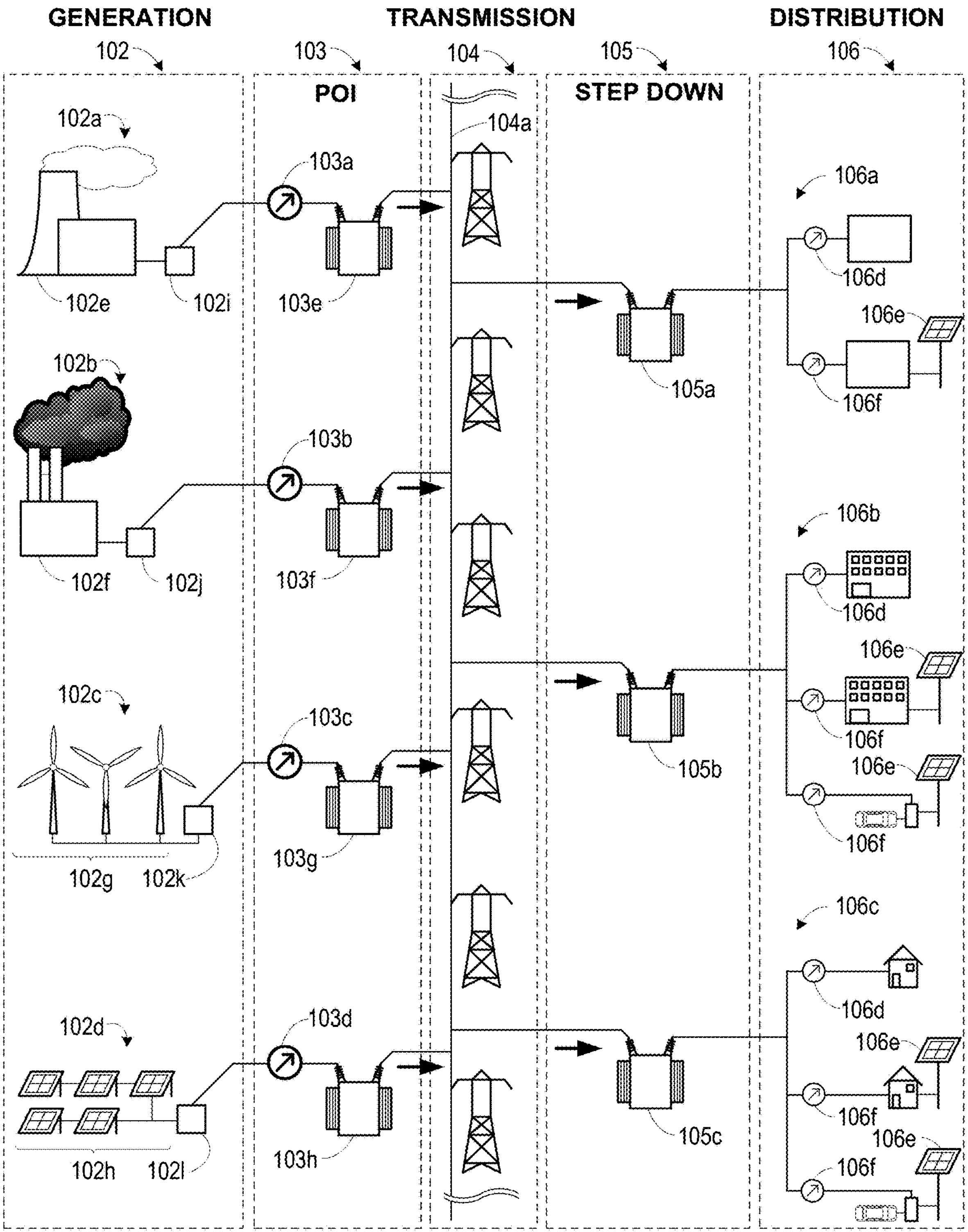

PRIOR ART
FIGURE 1

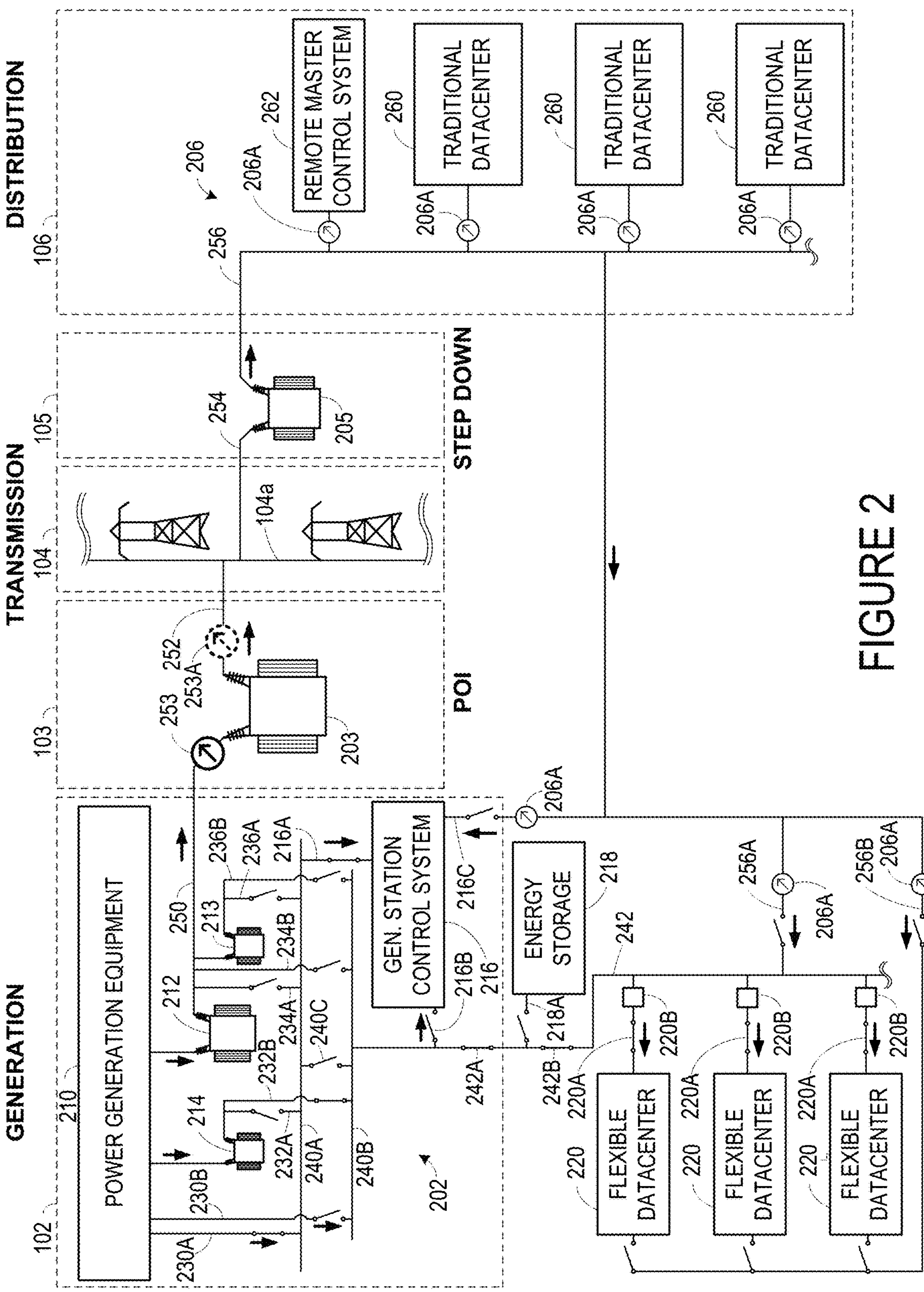
GENERATION
102
POWER GENERATION EQUIPMENT
210
230A
230B
214
212
213
232A
232B
234A
234B
236A
236B
240A
240B
240C
250
216A
216B
216C
216
GEN. STATION CONTROL SYSTEM
202
242A
242B
242
ENERGY STORAGE
218
218A
FLEXIBLE DATACENTER
220
220A
220B
206A
256A
256B
POI
103
203
253
253A
252
TRANSMISSION
104
104a
STEP DOWN
105
205
254
DISTRIBUTION
106
256
206
206A
262
REMOTE MASTER CONTROL SYSTEM
260
TRADITIONAL DATACENTER

FIGURE 2

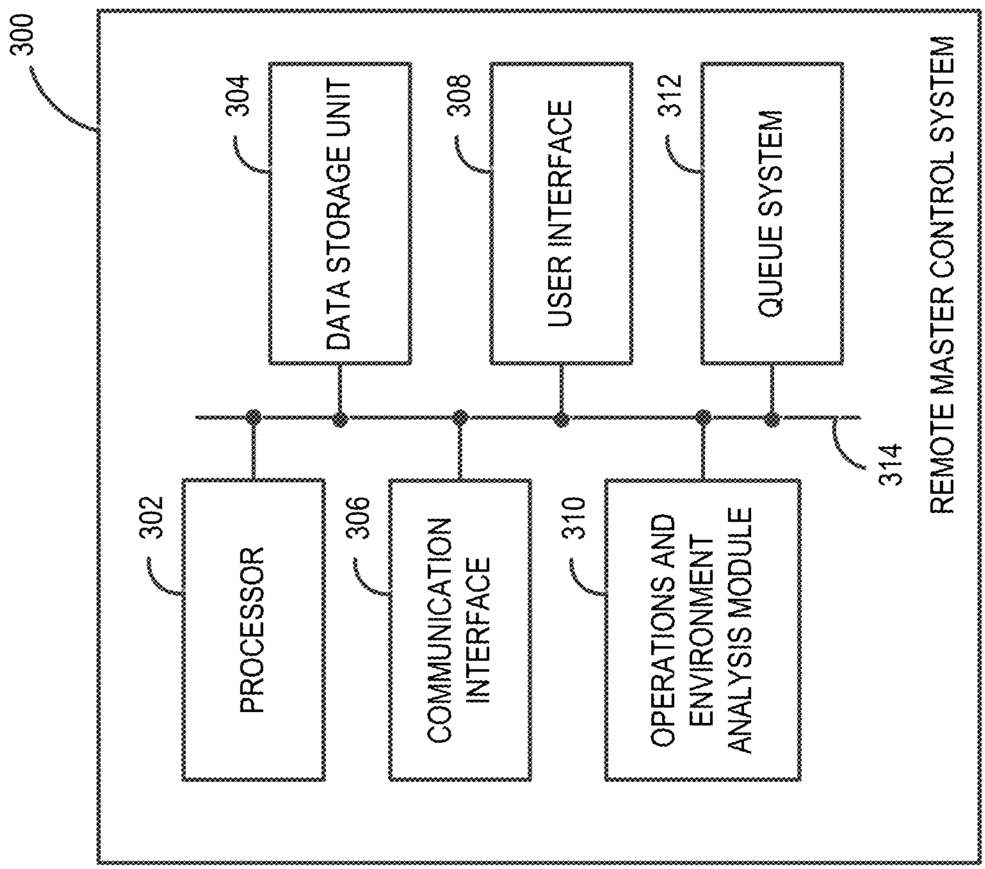
300
302
PROCESSOR
304
DATA STORAGE UNIT
306
COMMUNICATION INTERFACE
308
USER INTERFACE
310
OPERATIONS AND ENVIRONMENT ANALYSIS MODULE
312
QUEUE SYSTEM
314
REMOTE MASTER CONTROL SYSTEM

FIGURE 3

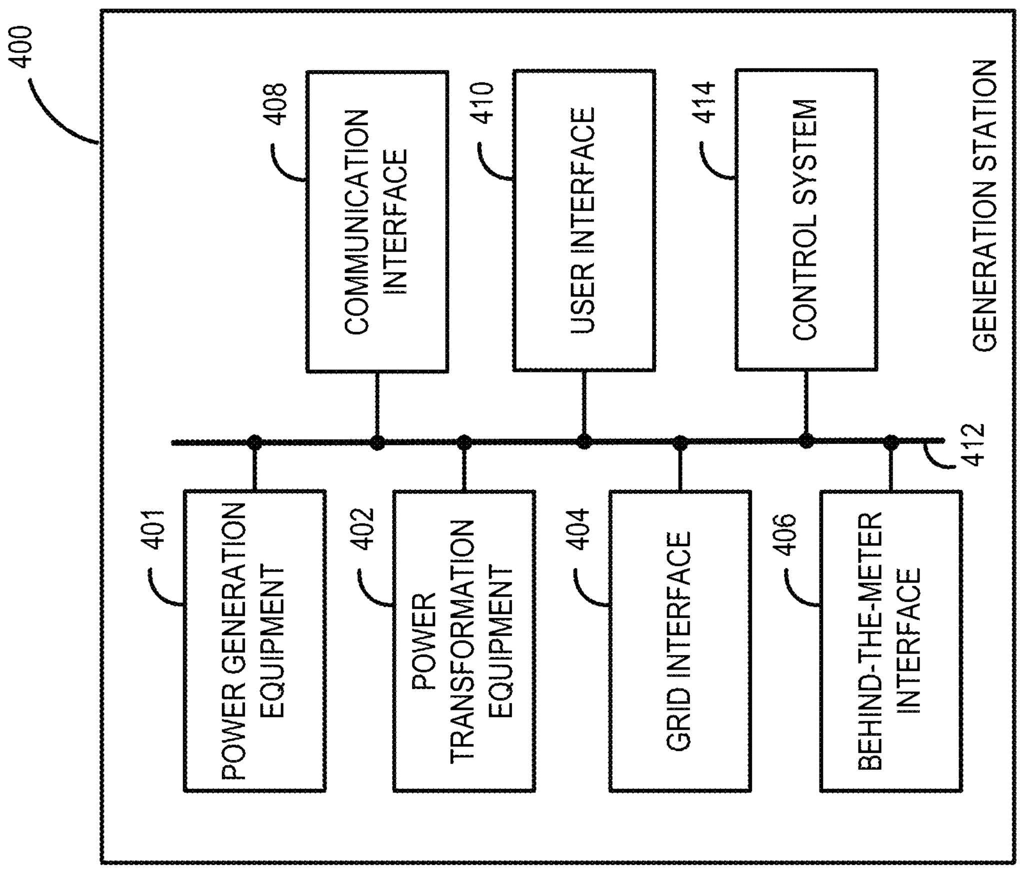
400
408
COMMUNICATION INTERFACE
410
USER INTERFACE
414
CONTROL SYSTEM
GENERATION STATION
412
401
POWER GENERATION EQUIPMENT
402
POWER TRANSFORMATION EQUIPMENT
404
GRID INTERFACE
406
BEHIND-THE-METER INTERFACE

FIGURE 4

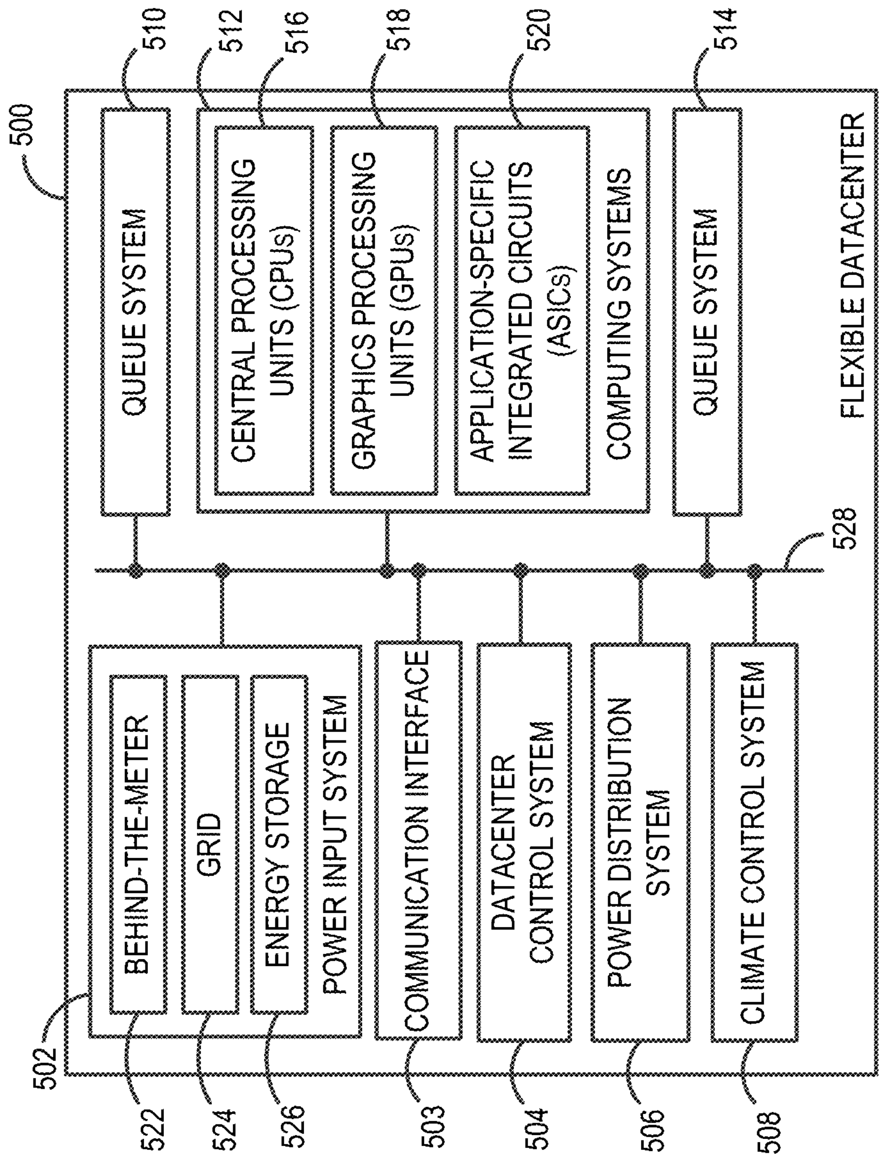
500
QUEUE SYSTEM
510
CENTRAL PROCESSING UNITS (CPUs)
516
GRAPHICS PROCESSING UNITS (GPUs)
518
APPLICATION-SPECIFIC INTEGRATED CIRCUITS (ASICs)
520
COMPUTING SYSTEMS
512
QUEUE SYSTEM
514
FLEXIBLE DATACENTER
528
BEHIND-THE-METER
522
GRID
524
ENERGY STORAGE
526
POWER INPUT SYSTEM
502
COMMUNICATION INTERFACE
503
DATACENTER CONTROL SYSTEM
504
POWER DISTRIBUTION SYSTEM
506
CLIMATE CONTROL SYSTEM
508

FIGURE 5

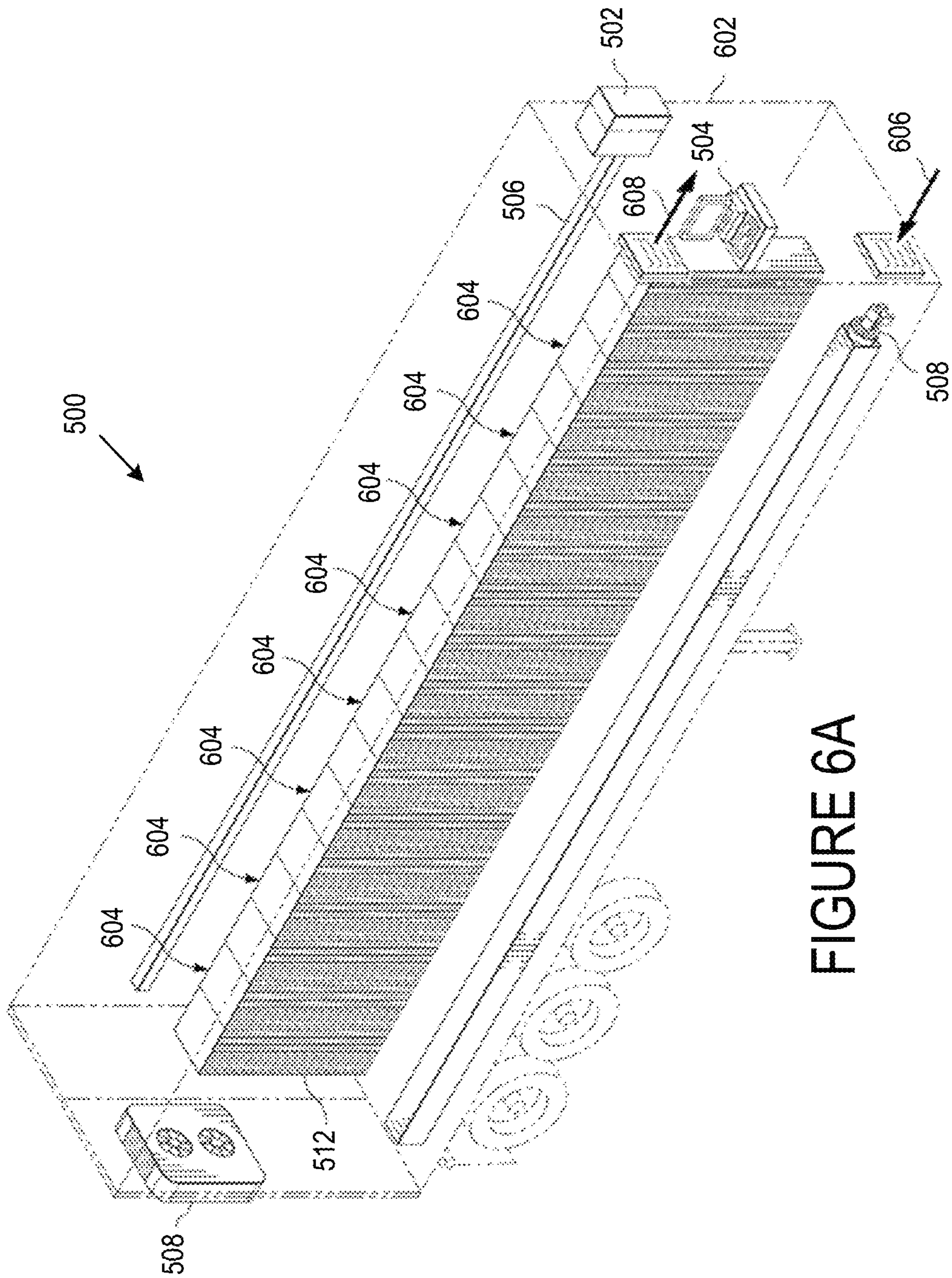
500
502
602
504
606
506
608
604
604
604
604
604
604
604
604
508
508
512

FIGURE 6A

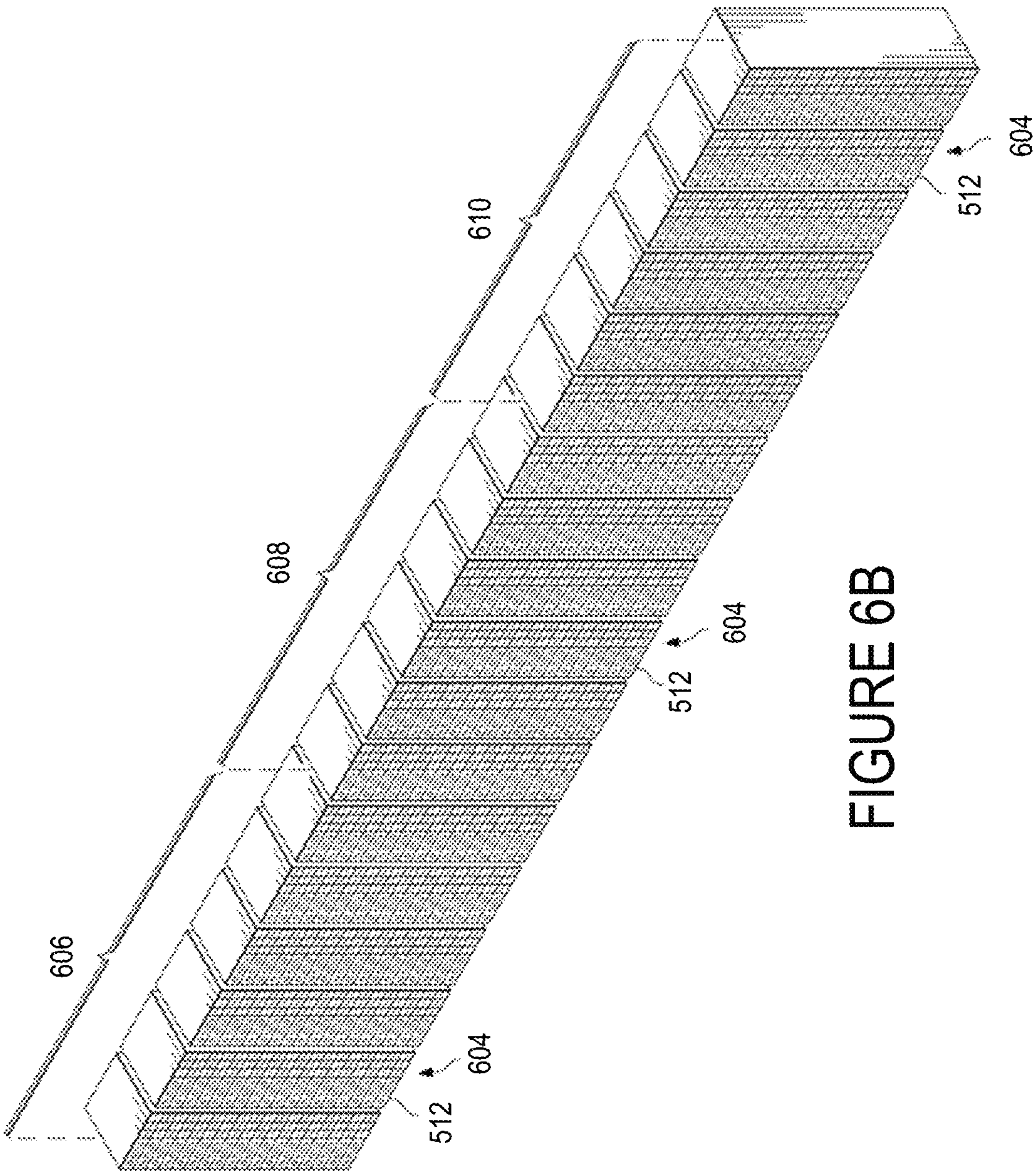

FIGURE 6B

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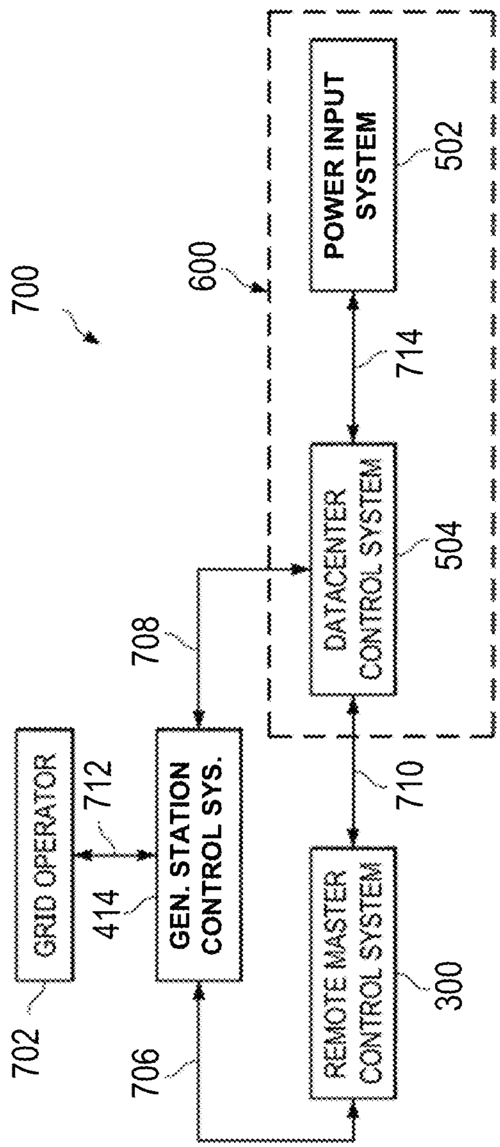

FIGURE 7

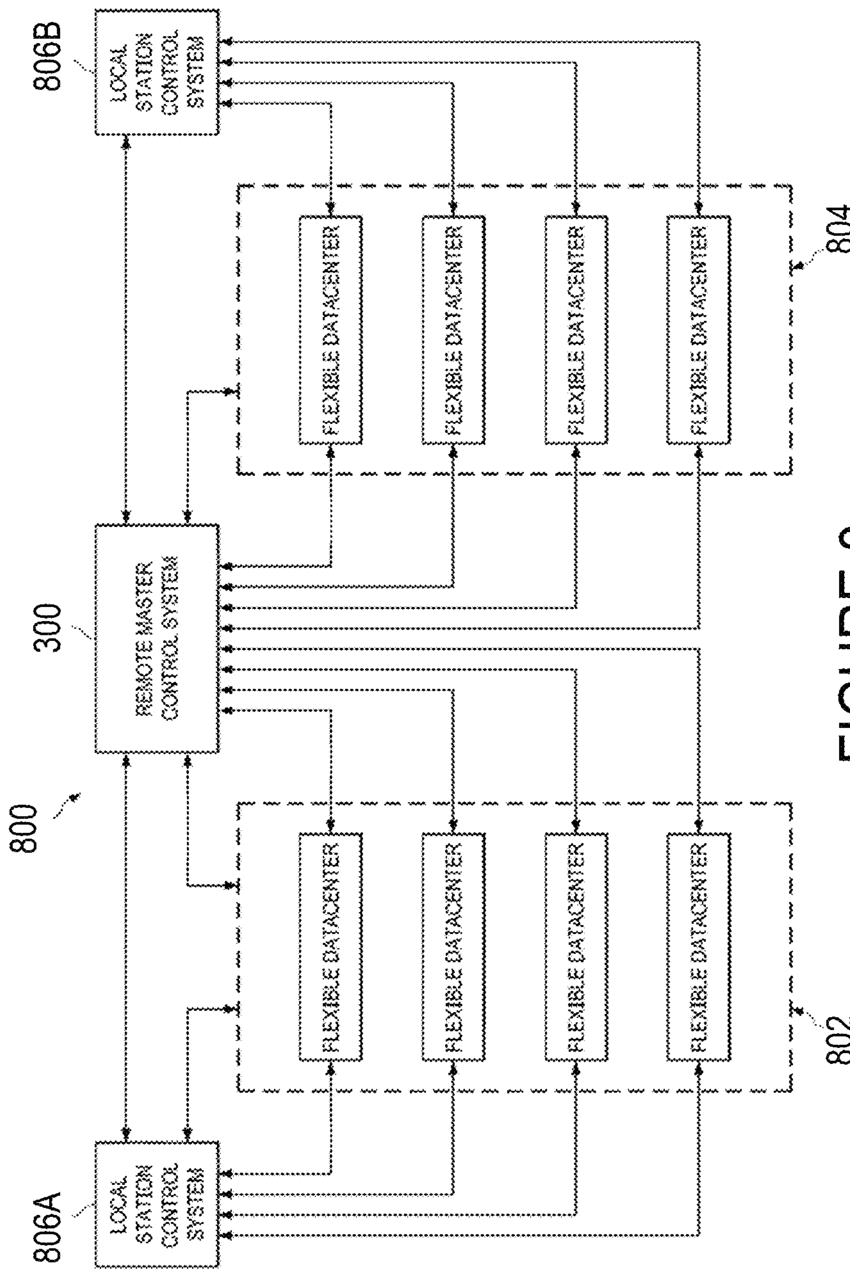
806B
LOCAL STATION CONTROL SYSTEM
804
FLEXIBLE DATACENTER
FLEXIBLE DATACENTER
FLEXIBLE DATACENTER
FLEXIBLE DATACENTER
300
REMOTE MASTER CONTROL SYSTEM
800
FLEXIBLE DATACENTER
FLEXIBLE DATACENTER
FLEXIBLE DATACENTER
FLEXIBLE DATACENTER
802
806A
LOCAL STATION CONTROL SYSTEM

FIGURE 8

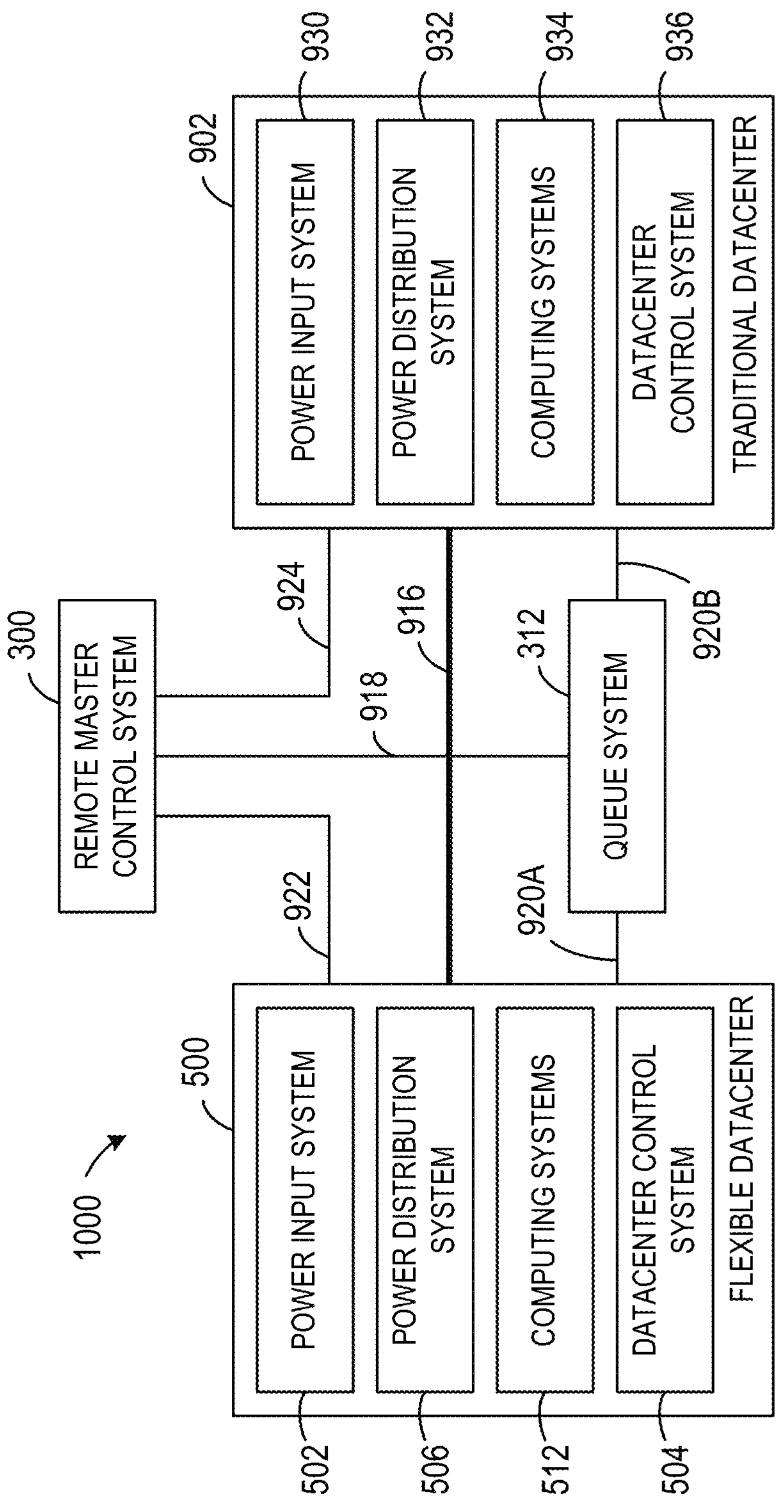
1000
300
REMOTE MASTER CONTROL SYSTEM
924
922
916
918
312
QUEUE SYSTEM
920A
920B
902
930
POWER INPUT SYSTEM
932
POWER DISTRIBUTION SYSTEM
934
COMPUTING SYSTEMS
936
DATACENTER CONTROL SYSTEM
TRADITIONAL DATACENTER
500
POWER INPUT SYSTEM
502
POWER DISTRIBUTION SYSTEM
506
COMPUTING SYSTEMS
512
DATACENTER CONTROL SYSTEM
504
FLEXIBLE DATACENTER

FIGURE 9

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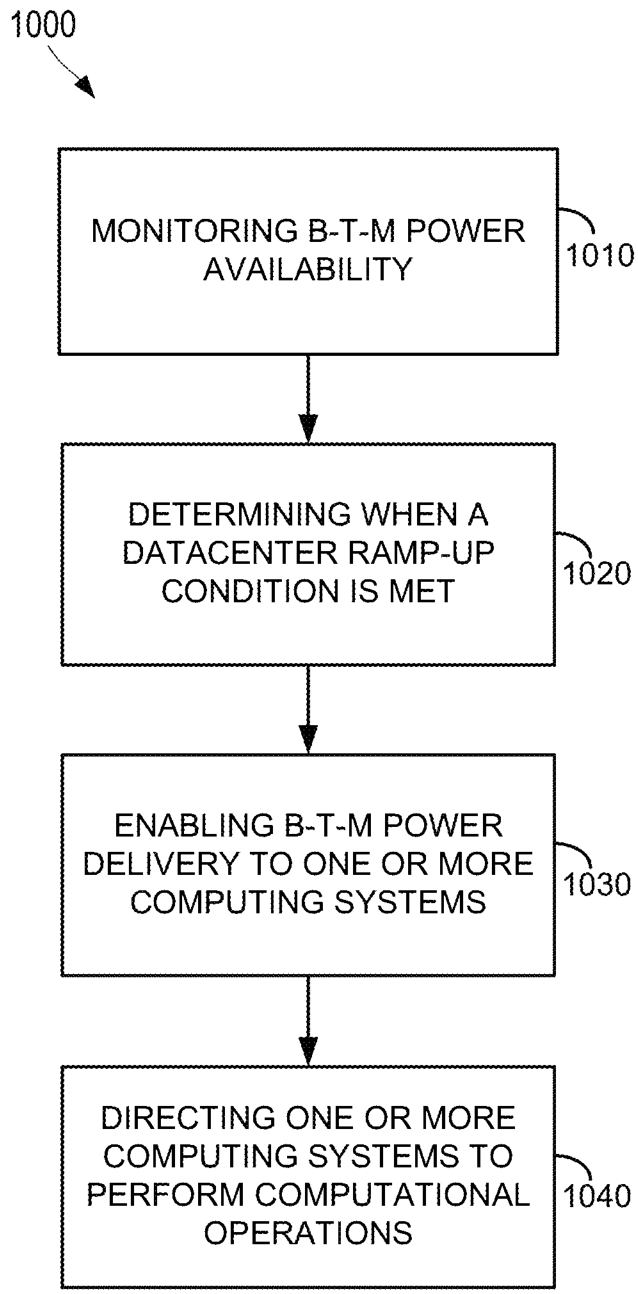

FIGURE 10A

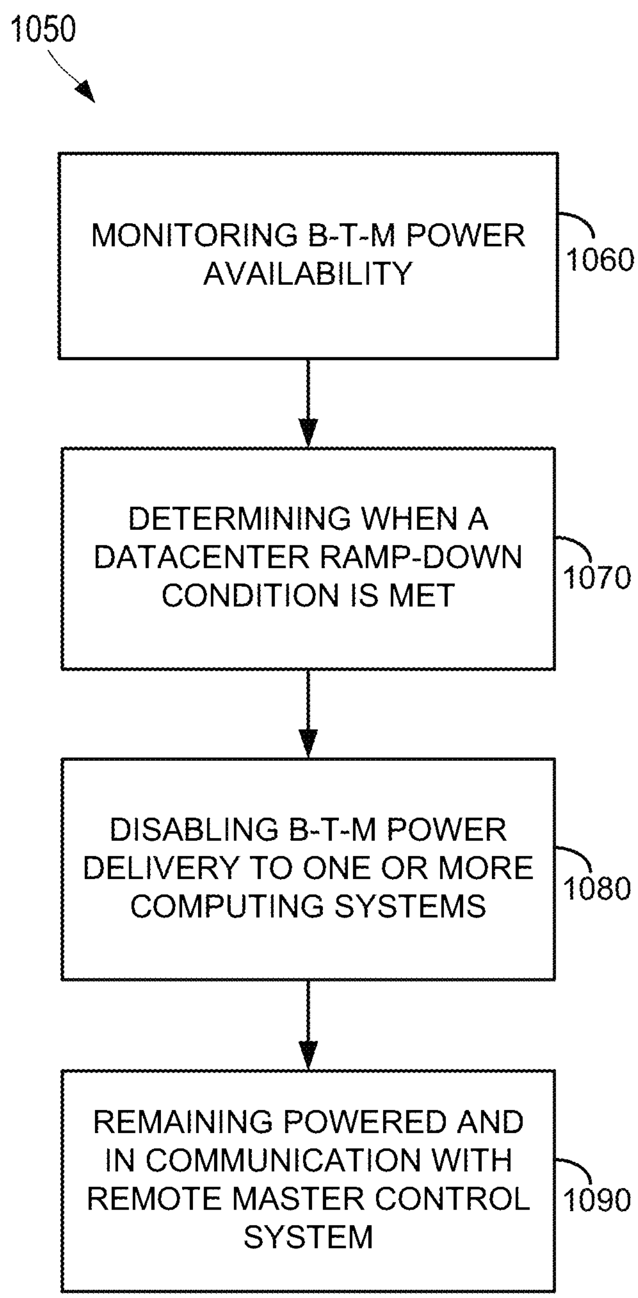
1050
MONITORING B-T-M POWER AVAILABILITY
1060
DETERMINING WHEN A DATACENTER RAMP-DOWN CONDITION IS MET
1070
DISABLING B-T-M POWER DELIVERY TO ONE OR MORE COMPUTING SYSTEMS
1080
REMAINING POWERED AND IN COMMUNICATION WITH REMOTE MASTER CONTROL SYSTEM
1090

FIGURE 10B

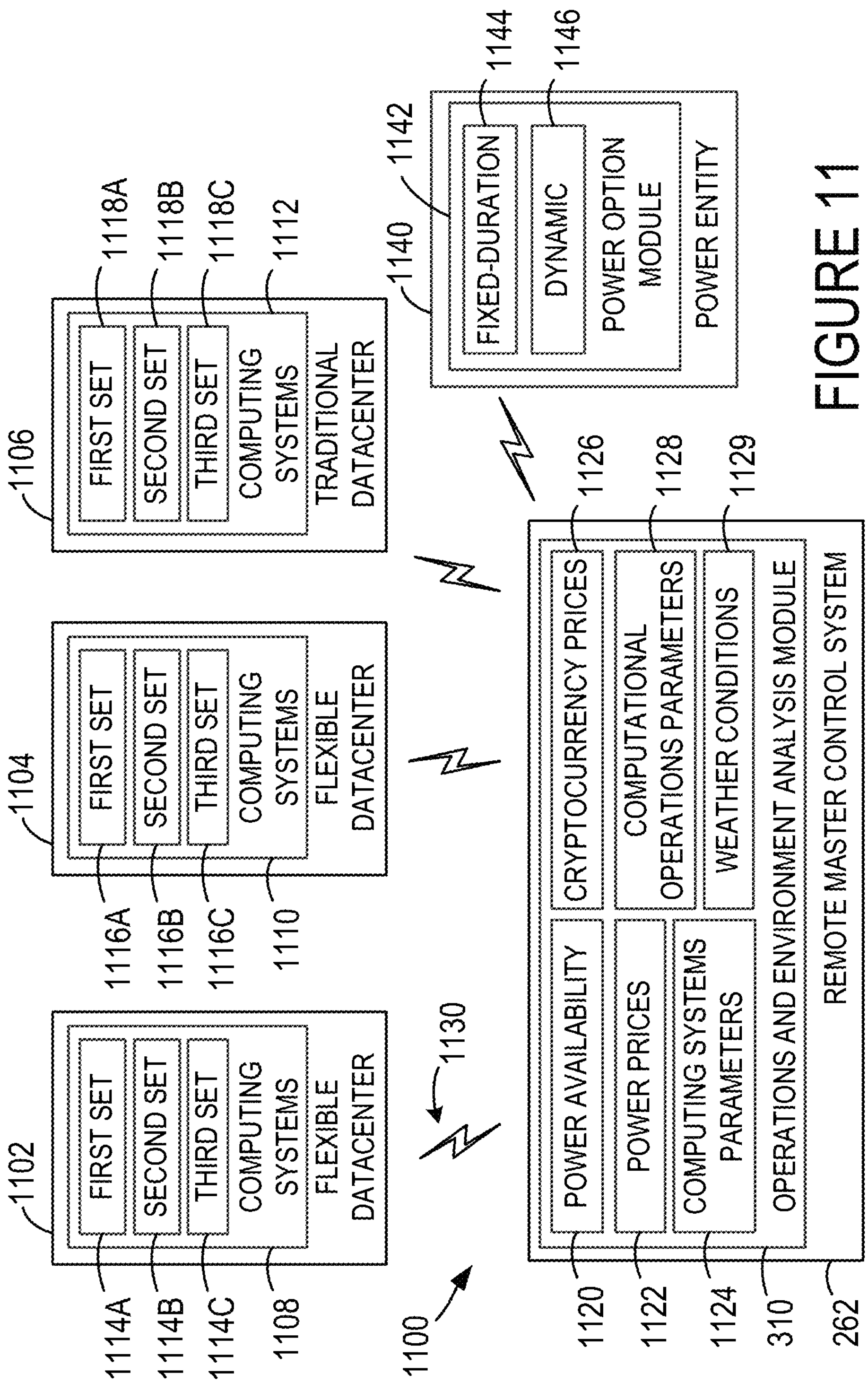
1100
1102
FIRST SET
SECOND SET
THIRD SET
COMPUTING SYSTEMS
FLEXIBLE DATACENTER
1114A
1114B
1114C
1108
1104
FIRST SET
SECOND SET
THIRD SET
COMPUTING SYSTEMS
FLEXIBLE DATACENTER
1116A
1116B
1116C
1110
1106
FIRST SET
SECOND SET
THIRD SET
COMPUTING SYSTEMS
TRADITIONAL DATACENTER
1118A
1118B
1118C
1112
1130
1140
1142
1144
1146
FIXED-DURATION
DYNAMIC
POWER OPTION MODULE
POWER ENTITY
POWER AVAILABILITY
POWER PRICES
COMPUTING SYSTEMS PARAMETERS
CRYPTOCURRENCY PRICES
COMPUTATIONAL OPERATIONS PARAMETERS
WEATHER CONDITIONS
OPERATIONS AND ENVIRONMENT ANALYSIS MODULE
REMOTE MASTER CONTROL SYSTEM
1120
1122
1124
310
262
1126
1128
1129

FIGURE 11

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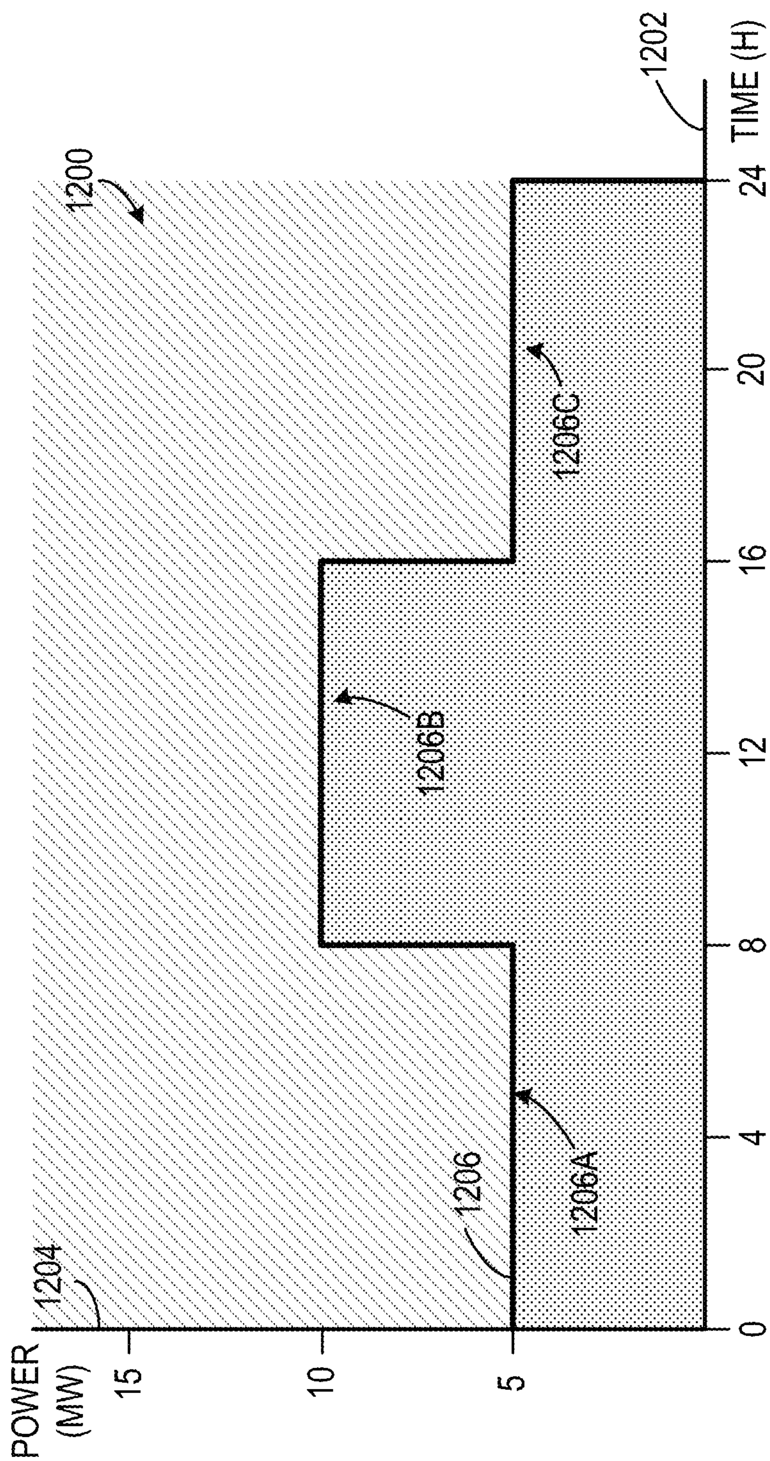

FIGURE 12

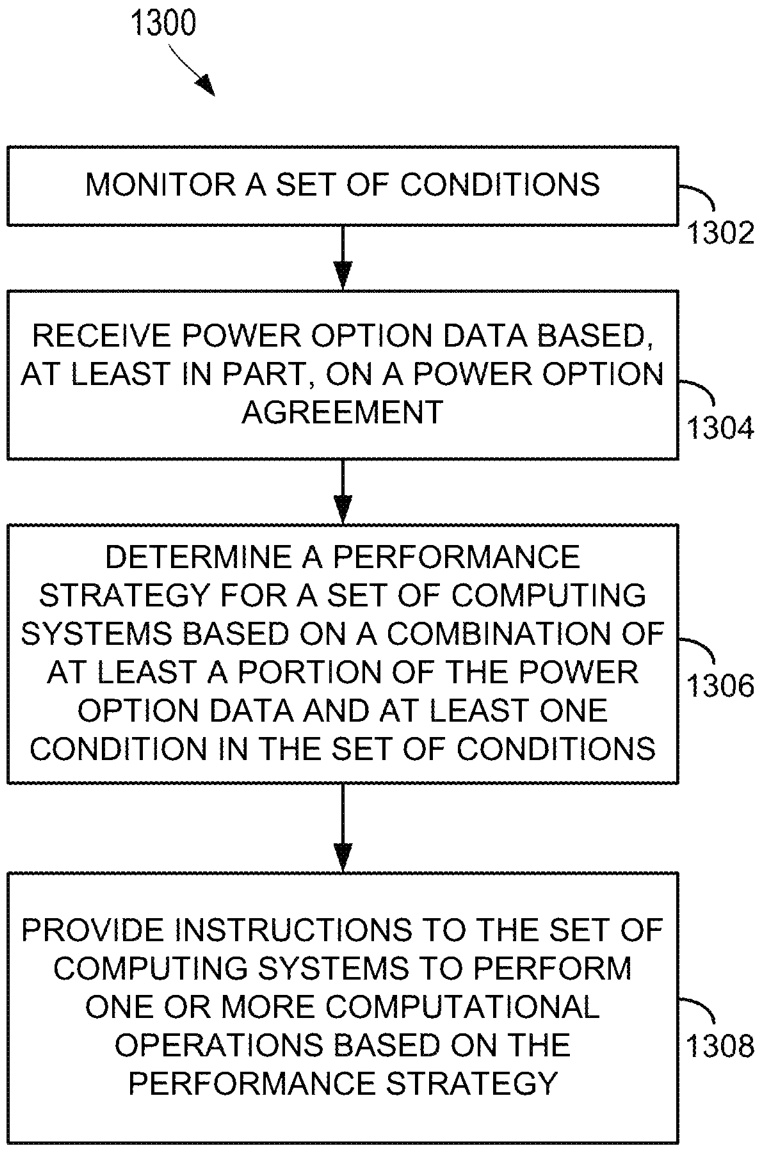
1300
MONITOR A SET OF CONDITIONS
1302
RECEIVE POWER OPTION DATA BASED, AT LEAST IN PART, ON A POWER OPTION AGREEMENT
1304
DETERMINE A PERFORMANCE STRATEGY FOR A SET OF COMPUTING SYSTEMS BASED ON A COMBINATION OF AT LEAST A PORTION OF THE POWER OPTION DATA AND AT LEAST ONE CONDITION IN THE SET OF CONDITIONS
1306
PROVIDE INSTRUCTIONS TO THE SET OF COMPUTING SYSTEMS TO PERFORM ONE OR MORE COMPUTATIONAL OPERATIONS BASED ON THE PERFORMANCE STRATEGY
1308

FIGURE 13

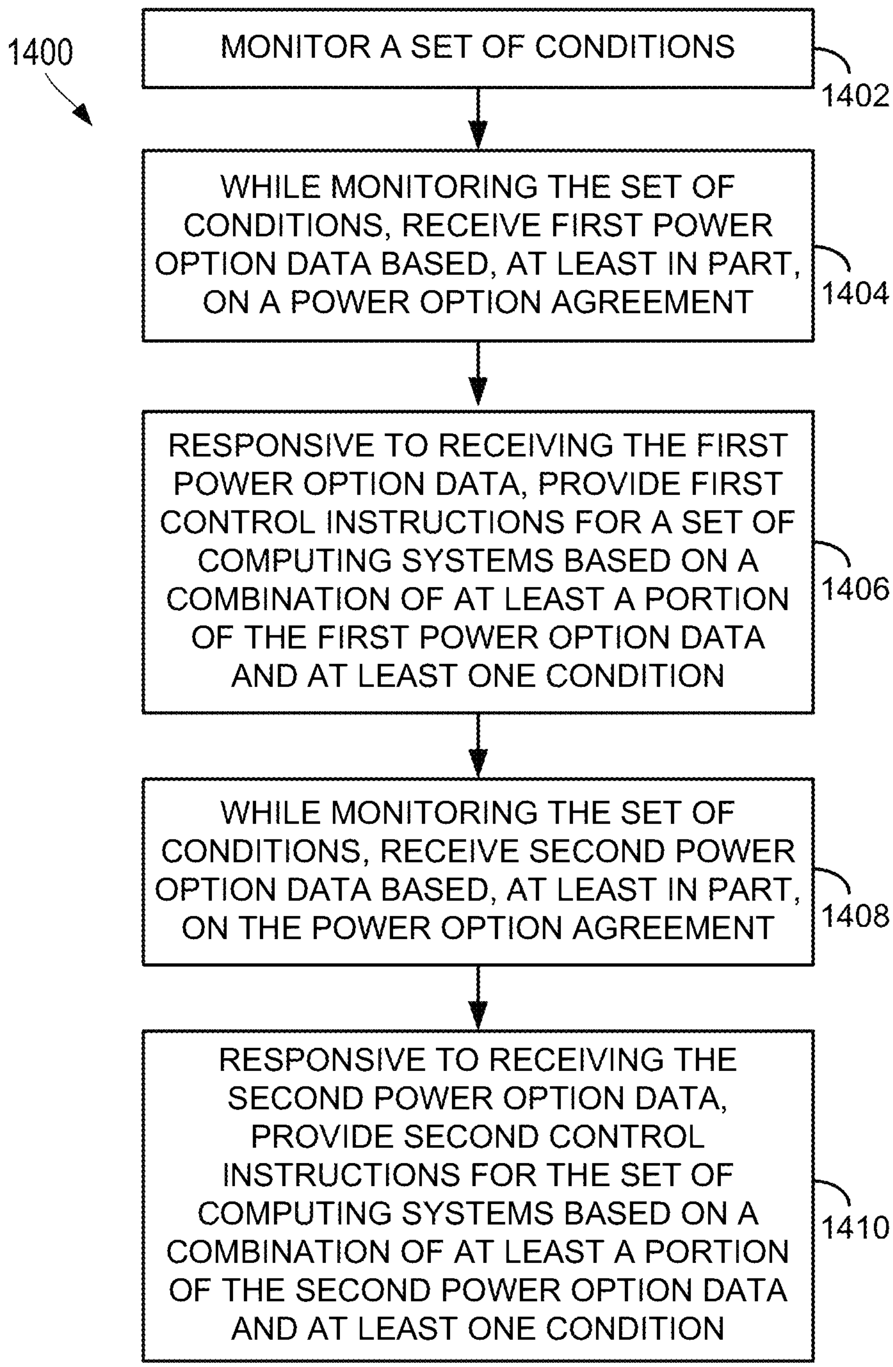
1400
MONITOR A SET OF CONDITIONS
1402
WHILE MONITORING THE SET OF CONDITIONS, RECEIVE FIRST POWER OPTION DATA BASED, AT LEAST IN PART, ON A POWER OPTION AGREEMENT
1404
RESPONSIVE TO RECEIVING THE FIRST POWER OPTION DATA, PROVIDE FIRST CONTROL INSTRUCTIONS FOR A SET OF COMPUTING SYSTEMS BASED ON A COMBINATION OF AT LEAST A PORTION OF THE FIRST POWER OPTION DATA AND AT LEAST ONE CONDITION
1406
WHILE MONITORING THE SET OF CONDITIONS, RECEIVE SECOND POWER OPTION DATA BASED, AT LEAST IN PART, ON THE POWER OPTION AGREEMENT
1408
RESPONSIVE TO RECEIVING THE SECOND POWER OPTION DATA, PROVIDE SECOND CONTROL INSTRUCTIONS FOR THE SET OF COMPUTING SYSTEMS BASED ON A COMBINATION OF AT LEAST A PORTION OF THE SECOND POWER OPTION DATA AND AT LEAST ONE CONDITION
1410

FIGURE 14

METHODS AND SYSTEMS FOR ADJUSTING POWER CONSUMPTION BASED ON A FIXED-DURATION POWER OPTION AGREEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority to U.S. Provisional Patent Application No. 62/927,119, filed Oct. 28, 2019, the entire contents of which are herein incorporated by reference.

FIELD

This specification relates to power consumption adjustments when using grid power and/or intermittent behind-the-meter power.

BACKGROUND

"Electrical grid" or "grid," as used herein, refers to a Wide Area Synchronous Grid (also known as an Interconnection), and is a regional scale or greater electric power grid that that operates at a synchronized frequency and is electrically tied together during normal system conditions. An electrical grid delivers electricity from generation stations to consumers. An electrical grid includes: (i) generation stations that produce electrical power at large scales for delivery through the grid, (ii) high voltage transmission lines that carry that power from the generation stations to demand centers, and (iii) distribution networks carry that power to individual customers.

FIG. **1** illustrates a typical electrical grid, such as a North American Interconnection or the synchronous grid of Continental Europe (formerly known as the UCTE grid). The electrical grid of FIG. **1** can be described with respect to the various segments that make up the grid.

A generation segment **102** includes one or more generation stations that produce utility-scale electricity (typically >50 MW), such as a nuclear plant **102***a*, a coal plant **102***b*, a wind power station (i.e., wind farm) **102***c*, and/or a photovoltaic power station (i.e., a solar farm) **102***d*. Generation stations are differentiated from building-mounted and other decentralized or local wind or solar power applications because they supply power at the utility level and scale (>50 MW), rather than to a local user or users. The primary purpose of generation stations is to produce power for distribution through the grid, and in exchange for payment for the supplied electricity. Each of the generation stations **102***a-d* includes power generation equipment **102***e-h*, respectively, typically capable of supply utility-scale power (>50 MW). For example, the power generation equipment **102***g* at wind power station **102***c* includes wind turbines, and the power generation equipment **102***h* at photovoltaic power station **102***d* includes photovoltaic panels.

Each of the generation stations **102***a-d* may further include station electrical equipment **102***i*-**1** respectively. Station electrical equipment **102***i*-**1** are each illustrated in FIG. **1** as distinct elements for simplified illustrative purposes only and may, alternatively or additionally, be distributed throughout the power generation equipment, **102***e-h*, respectively. For example, at wind power station **102***c*, each wind turbine may include transformers, frequency converters, power converters, and/or electrical filters. Energy generated at each wind turbine may be collected by distribution lines along strings of wind turbines and move through

collectors, switches, transformers, frequency converters, power converters, electrical filters, and/or other station electrical equipment before leaving the wind power station **102***c*. Similarly, at photovoltaic power station **102***d*, individual photovoltaic panels and/or arrays of photovoltaic panels may include inverters, transformers, frequency converters, power converters, and/or electrical filters. Energy generated at each photovoltaic panel and/or array may be collected by distribution lines along the photovoltaic panels and move through collectors, switches, transformers, frequency converters, power converters, electrical filters, and/or other station electrical equipment before leaving the photovoltaic power station **102***d*.

Each generation station **102***a-d* may produce AC or DC electrical current which is then typically stepped up to a higher AC voltage before leaving the respective generation station. For example, wind turbines may typically produce AC electrical energy at 600V to 700V, which may then be stepped up to 34.5 kV before leaving the generation station **102***d*. In some cases, the voltage may be stepped up multiple times and to a different voltage before exiting the generation station **102***c*. As another example, photovoltaic arrays may produce DC voltage at 600V to 900V, which is then inverted to AC voltage and may be stepped up to 34.5 kV before leaving the generation station **102***d*. In some cases, the voltage may be stepped up multiple times and to a different voltage before exiting the generation station **102***d*.

Upon exiting the generation segment **102**, electrical power generated at generation stations **102***a-d* passes through a respective Point of Interconnection ("POI") **103** between a generation station (e.g., **102***a-d*) and the rest of the grid. A respective POI **103** represents the point of connection between a generation station's (e.g. **102***a-d*) equipment and a transmission system (e.g., transmission segment **104**) associated with electrical grid. In some cases, at the POI **103**, generated power from generation stations **102***a-d* may be stepped up at transformer systems **103***e-h* to high voltage scales suitable for long-distance transmission along transmission lines **104***a*. Typically, the generated electrical energy leaving the POI **103** will be at 115 kV AC or above, but in some cases it may be as low as, for example, 69 kV for shorter distance transmissions along transmission lines **104***a*. Each of transformer systems **103***e-h* may be a single transformer or may be multiple transformers operating in parallel or series and may be co-located or located in geographically distinct locations. Each of the transformer systems **103***e-h* may include substations and other links between the generation stations **102***a-d* and the transmission lines **104***a*.

A key aspect of the POI **103** is that this is where generation-side metering occurs. One or more utility-scale generation-side meters **103***a-d* (e.g., settlement meters) are located at settlement metering points at the respective POI **103** for each generation station **102***a-d*. The utility-scale generation-side meters **103***a-d* measure power supplied from generation stations **102***a-d* into the transmission segment **104** for eventual distribution throughout the grid.

For electricity consumption, the price consumers pay for power distributed through electric power grids is typically composed of, among other costs, Generation, Administration, and Transmission & Distribution ("T&D") costs. T&D costs represent a significant portion of the overall price paid by consumers for electricity. These costs include capital costs (land, equipment, substations, wire, etc.), costs associated with electrical transmission losses, and operation and maintenance costs.

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For utility-scale electricity supply, operators of generation stations (e.g., **102***a-d*) are paid a variable market price for the amount of power the operator generates and provides to the grid, which is typically determined via a power purchase agreement (PPA) between the generation station operator and a grid operator. The amount of power the generation station operator generates and provides to the grid is measured by utility-scale generation-side meters (e.g., **103***a-d*) at settlement metering points. As illustrated in FIG. **1**, the utility-scale generation-side meters **103***a-d* are shown on a low side of the transformer systems **103***e-h*), but they may alternatively be located within the transformer systems **103***e-h* or on the high side of the transformer systems **103***e-h*. A key aspect of a utility-scale generation-side meter is that it is able to meter the power supplied from a specific generation station into the grid. As a result, the grid operator can use that information to calculate and process payments for power supplied from the generation station to the grid. That price paid for the power supplied from the generation station is then subject to T&D costs, as well as other costs, in order to determine the price paid by consumers.

After passing through the utility-scale generation-side meters in the POI **103**, the power originally generated at the generation stations **102***a-d* is transmitted onto and along the transmission lines **104***a* in the transmission segment **104**. Typically, the electrical energy is transmitted as AC at 115 kV+ or above, though it may be as low as 69 kV for short transmission distances. In some cases, the transmission segment **104** may include further power conversions to aid in efficiency or stability. For example, transmission segment **104** may include high-voltage DC ("HVDC") portions (along with conversion equipment) to aid in frequency synchronization across portions of the transmission segment **104**. As another example, transmission segment **104** may include transformers to step AC voltage up and then back down to aid in long distance transmission (e.g., 230 kV, 500 kV, 765 kV, etc.).

Power generated at the generation stations **104***a-d* is ultimately destined for use by consumers connected to the grid. Once the energy has been transmitted along the transmission segment **104**, the voltage will be stepped down by transformer systems **105***a-c* in the step down segment **105** so that it can move into the distribution segment **106**.

In the distribution segment **106**, distribution networks **106***a-c* take power that has been stepped down from the transmission lines **104***a* and distribute it to local customers, such as local sub-grids (illustrated at **106***a*), industrial customers, including large EV charging networks (illustrated at **106***b*), and/or residential and retail customers, including individual EV charging stations (illustrated at **106***c*). Customer meters **106***d*, **106***f* measure the power used by each of the grid-connected customers in distribution networks **106***a-c*. Customer meters **106***d* are typically load meters that are unidirectional and measure power use. Some of the local customers in the distribution networks **106***a-d* may have local wind or solar power systems **106***e* owned by the customer. As discussed above, these local customer power systems **106***e* are decentralized and supply power directly to the customer(s). Customers with decentralized wind or solar power systems **106***e* may have customer meters **106***f* that are bidirectional or net-metering meters that can track when the local customer power systems **106***e* produce power in excess of the customer's use, thereby allowing the utility to provide a credit to the customer's monthly electricity bill. Customer meters **106***d*, **106***f* differ from utility-scale generation-side meters (e.g., settlement meters) in at least the following characteristics: design (electro-mechanical or electronic vs current transformer), scale (typically less than 1600 amps vs. typically greater than 50 MW; typically less than 600V vs. typically greater than 14 kV), primary function (use vs. supply metering), economic purpose (credit against use vs payment for power), and location (in a distribution network at point of use vs. at a settlement metering point at a Point of Interconnection between a generation station and a transmission line).

To maintain stability of the grid, the grid operator strives to maintain a balance between the amount of power entering the grid from generation stations (e.g., **102***a-d*) and the amount of grid power used by loads (e.g., customers in the distribution segment **106**). In order to maintain grid stability and manage congestion, grid operators may take steps to reduce the supply of power arriving from generation stations (e.g., **102***a-d*) when necessary (e.g., curtailment). Particularly, grid operators may decrease the market price paid for generated power to dis-incentivize generation stations (e.g., **102***a-d*) from generating and supplying power to the grid. In some cases, the market price may even go negative such that generation station operators must pay for power they allow into the grid. In addition, some situations may arise where grid operators explicitly direct a generation station (e.g., **102***a-d*) to reduce or stop the amount of power the station is supplying to the grid.

Power market fluctuations, power system conditions (e.g., power factor fluctuation or generation station startup and testing), and operational directives resulting in reduced or discontinued generation all can have disparate effects on renewal energy generators and can occur multiple times in a day and last for indeterminate periods of time. Curtailment, in particular, is particularly problematic.

According to the National Renewable Energy Laboratory's Technical Report TP-6A20-60983 (March 2014):

> [C]urtailment [is] a reduction in the output of a generator from what it could otherwise produce given available resources (e.g., wind or sunlight), typically on an involuntary basis. Curtailments can result when operators or utilities command wind and solar generators to reduce output to minimize transmission congestion or otherwise manage the system or achieve the optimal mix of resources. Curtailment of wind and solar resources typically occurs because of transmission congestion or lack of transmission access, but it can also occur for reasons such as excess generation during low load periods that could cause baseload generators to reach minimum generation thresholds, because of voltage or interconnection issues, or to maintain frequency requirements, particularly for small, isolated grids. Curtailment is one among many tools to maintain system energy balance, which can also include grid capacity, hydropower and thermal generation, demand response, storage, and institutional changes. Deciding which method to use is primarily a matter of economics and operational practice.
>
> "Curtailment" today does not necessarily mean what it did in the early 2000s. Two separate changes in the electric sector have shaped curtailment practices since that time: the utility-scale deployment of wind power, which has no fuel cost, and the evolution of wholesale power markets. These simultaneous changes have led to new operational challenges but have also expanded the array of market-based tools for addressing them.
>
> Practices vary significantly by region and market design. In places with centrally-organized wholesale power markets and experience with wind power, manual wind energy curtailment processes are increasingly being

replaced by transparent offer-based market mechanisms that base dispatch on economics. Market protocols that dispatch generation based on economics can also result in renewable energy plants generating less than what they could potentially produce with available wind or sunlight. This is often referred to by grid operators by other terms, such as "downward dispatch." In places served primarily by vertically integrated utilities, power purchase agreements (PPAs) between the utility and the wind developer increasingly contain financial provisions for curtailment contingencies.

Some reductions in output are determined by how a wind operator values dispatch versus non-dispatch. Other curtailments of wind are determined by the grid operator in response to potential reliability events. Still other curtailments result from overdevelopment of wind power in transmission-constrained areas.

Dispatch below maximum output (curtailment) can be more of an issue for wind and solar generators than it is for fossil generation units because of differences in their cost structures. The economics of wind and solar generation depend on the ability to generate electricity whenever there is sufficient sunlight or wind to power their facilities.

Because wind and solar generators have substantial capital costs but no fuel costs (i.e., minimal variable costs), maximizing output improves their ability to recover capital costs. In contrast, fossil generators have higher variable costs, such as fuel costs. Avoiding these costs can, depending on the economics of a specific generator, to some degree reduce the financial impact of curtailment, especially if the generator's capital costs are included in a utility's rate base.

Curtailment may result in available energy being wasted because solar and wind operators have zero variable cost (which may not be true to the same extent for fossil generation units which can simply reduce the amount of fuel that is being used). With wind generation, in particular, it may also take some time for a wind farm to become fully operational following curtailment. As such, until the time that the wind farm is fully operational, the wind farm may not be operating with optimum efficiency and/or may not be able to provide power to the grid.

SUMMARY

In an example, a system includes a set of computing systems. The set of computing systems is configured to perform computational operations using power from a power grid. The system also includes a control system configured to monitor a set of conditions and, while monitoring the set of conditions, receive first power option data based, at least in part, on a power option agreement. The first power option data specify a first minimum power threshold associated with a first time interval. The control system is further configured to provide first control instructions for the set of computing systems based on a combination of at least a portion of the first power option data and at least one condition of the set of conditions responsive to receiving the first power option data. The first control instructions comprises a first power consumption target for the set of computing systems for the first time interval, and the first power consumption target is equal to or greater than the first minimum power threshold associated with the first time interval. The control system is also configured to, while monitoring the set of conditions, receive second power option data based, at least in part, on the power option agreement. The second power option data specify a second minimum power threshold associated with a second time interval. Responsive to receiving the second power option data, the control system is configured to provide second control instructions for the set of computing systems based on a combination of at least a portion of the second power data and at least one condition of the set of conditions. The second control instructions comprises a second power consumption target for the set of computing systems for the second time interval, and wherein the second power consumption target is equal to or greater than the second minimum power threshold associated with the second time interval.

In another example, a method involves monitoring, at a computing system, a set of conditions, and while monitoring the set of conditions, receiving first power option data based, at least in part, on a power option agreement. The first power option data specify a first minimum power threshold associated with a first time interval. The method further involves, responsive to receiving the first power option data, providing first control instructions for a set of computing systems based on a combination of at least a portion of the first power option data and at least one condition of the set of conditions. The first control instructions comprises a first power consumption target for the set of computing systems for the first time interval, and the first power consumption target is equal to or greater than the first minimum power threshold associated with the first time interval. The method further involves, while monitoring the set of conditions, receiving second power option data based, at least in part, on the power option agreement. The second power option data specify a second minimum power threshold associated with a second time interval. The method also involves, responsive to receiving the second power option data, providing second control instructions for the set of computing systems based on a combination of at least a portion of the second power data and at least one condition of the set of conditions. The second control instructions comprises a second power consumption target for the set of computing systems for the second time interval, and the second power consumption target is equal to or greater than the second minimum power threshold associated with the second time interval.

In yet another example, a system is provided. The system includes a set of computing systems, where the set of computing systems is configured to perform computational operations using power from a power grid. The system also includes a control system configured to monitor a set of conditions and receive power option data based, at least in part, on a power option agreement. The power option data specify: (i) a set of minimum power thresholds, and (ii) a set of time intervals, where each minimum power threshold in the set of minimum power thresholds is associated with a time interval in the set of time intervals. The control system is further configured to, responsive to receiving the power option data, determine a performance strategy for the set of computing systems based on a combination of at least a portion of the power option data and at least one condition in the set of conditions. The performance strategy comprises a power consumption target for the set of computing systems for each time interval in the set of time intervals, where each power consumption target is equal to or greater than the minimum power threshold associated with each time interval. The control system is also configured to provide instructions to the set of computing systems to perform one or more computational operations based on the performance strategy.

In a further example, non-transitory computer-readable medium is described that is configured to store instructions,

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that when executed by a computing system, causes the computing system to perform operations consistent with the method steps described above.

Other aspects of the present invention will be apparent from the following description and claims.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** shows a typical electrical grid.

FIG. **2** shows a behind-the-meter arrangement with optional grid power, including one or more flexible datacenters, according to one or more example embodiments.

FIG. **3** shows a block diagram of a remote master control system, according to one or more example embodiments.

FIG. **4** a block diagram of a generation station, according to one or more example embodiments.

FIG. **5** shows a block diagram of a flexible datacenter, according to one or more example embodiments.

FIG. **6**A shows a structural arrangement of a flexible datacenter, according to one or more example embodiments.

FIG. **6**B shows a set of computing systems arranged in a straight configuration, according to one or more example embodiments.

FIG. **7** shows a control distribution system for a flexible datacenter, according to one or more example embodiments.

FIG. **8** shows a control distribution system for a fleet of flexible datacenters, according to one or more example embodiments.

FIG. **9** shows a queue distribution system for a traditional datacenter and a flexible datacenter, according to one or more example embodiments.

FIG. **10**A shows a method of dynamic power consumption at a flexible datacenter using behind-the-meter power, according to one or more example embodiments.

FIG. **10**B shows a method of dynamic power delivery at a flexible datacenter using behind-the-meter power, according to one or more example embodiments.

FIG. **11** shows a block diagram of a system for implementing power consumption adjustments based on a power option agreement, according to one or more embodiments.

FIG. **12** shows a graph representing power option data based on a power option agreement, according to one or more embodiments.

FIG. **13** shows a method for implementing power consumption adjustments based on a fixed-duration power option agreement, according to one or more embodiments.

FIG. **14** shows a method for implementing power consumption adjustments based on a dynamic power option agreement, according to one or more embodiments.

DETAILED DESCRIPTION

Disclosed examples will now be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all of the disclosed examples are shown. Different examples may be described and should not be construed as limited to the examples set forth herein.

As discussed above, the market price paid to generation stations for supplying power to the grid often fluctuates due to various factors, including the need to maintain grid stability and based on current demand and usage by connected loads in distribution networks. Due to these factors, situations can arise where generation stations are offered substantially lower prices to deter an over-supply of power to the grid. Although these situations typically exist temporarily, generation stations are sometimes forced to either sell power to the grid at the much lower prices or adjust

operations to decrease the amount of power generated. Furthermore, some situations may even require generation stations to incur costs in order to offload power to the grid or to shut down generation temporarily.

The volatility in the market price offered for power supplied to the grid can be especially problematic for some types of generation stations. In particular, wind farms and some other types of renewable resource power producers may lack the ability to quickly adjust operations in response to changes in the market price offered for supplying power to the grid. As a result, power generation and management at some generation stations can be inefficient, which can frequently result in power being sold to the grid at low or negative prices. In some situations, a generation station may even opt to halt power generation temporarily to avoid such unfavorable pricing. As such, the time required to halt and to restart the power generation at a generation station can reduce the generation station's ability to take advantage of rising market prices for power supplied to the grid.

Example embodiments provided herein aim to assist generation stations in managing power generation operations and avoid unfavorable power pricing situations like those described above. In particular, example embodiments may involve providing a load that is positioned behind-the-meter ("BTM") and enabling the load to utilize power received behind-the-meter at a generation station in a timely manner. As a general rule of thumb, BTM power is not subject to traditional T&D costs.

For purposes herein, a generation station is considered to be configured for the primary purpose of generating utility-scale power for supply to the electrical grid (e.g., a Wide Area Synchronous Grid or a North American Interconnect).

In one embodiment, equipment located behind-the-meter ("BTM equipment") is equipment that is electrically connected to a generation station's power generation equipment behind (i.e., prior to) the generation station's POI with an electrical grid.

In one embodiment, behind-the-meter power ("BTM power") is electrical power produced by a generation station's power generation equipment and utilized behind (i.e., prior to) the generation station's POI with an electrical grid.

In another embodiment, equipment may be considered behind-the-meter if it is electrically connected to a generation station that is subject to metering by a utility-scale generation-side meter (e.g., settlement meter), and the BTM equipment receives power from the generation station, but the power received by the BTM equipment from the generation station has not passed through the utility-scale generation-side meter. In one embodiment, the utility-scale generation-side meter for the generation station is located at the generation station's POI. In another embodiment, the utility-scale generation-side meter for the generation station is at a location other than the POI for the generation station—for example, a substation between the generation station and the generation station's POI.

In another embodiment, power may be considered behind-the-meter if it is electrical power produced at a generation station that is subject to metering by a utility-scale generation-side meter (e.g., settlement meter), and the BTM power is utilized before being metered at the utility-scale generation-side meter. In one embodiment, the utility-scale generation-side meter for the generation station is located at the generation station's POI. In another embodiment, the utility-scale generation-side meter for the generation station is at a location other than the POI for the generation station—for example, a substation between the generation station and the generation station's POI.

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In another embodiment, equipment may be considered behind-the-meter if it is electrically connected to a generation station that supplies power to a grid, and the BTM equipment receives power from the generation station that is not subject to T&D charges, but power received from the grid that is supplied by the generation station is subject to T&D charges.

In another embodiment, power may be considered behind-the-meter if it is electrical power produced at a generation station that supplies power to a grid, and the BTM power is not subject to T&D charges before being used by electrical equipment, but power received from the grid that is supplied by the generation station is subject to T&D charges.

In another embodiment, equipment may be considered behind-the-meter if the BTM equipment receives power generated from the generation station and that received power is not routed through the electrical grid before being delivered to the BTM equipment.

In another embodiment, power may be considered behind-the-meter if it is electrical power produced at a generation station, and BTM equipment receives that generated power, and that generated power received by the BTM equipment is not routed through the electrical grid before being delivered to the BTM equipment.

For purposes herein, BTM equipment may also be referred to as a behind-the-meter load ("BTM load") when the BTM equipment is actively consuming BTM power.

Beneficially, where BTM power is not subject to traditional T&D costs, a wind farm or other type of generation station can be connected to BTM loads which can allow the generation station to selectively avoid the adverse or less-than optimal cost structure occasionally associated with supplying power to the grid by shunting generated power to the BTM load.

An arrangement that positions and connects a BTM load to a generation station can offer several advantages. In such arrangements, the generation station may selectively choose whether to supply power to the grid or to the BTM load, or both. The operator of a BTM load may pay to utilize BTM power at a cost less than that charged through a consumer meter (e.g., **106***d*, **1060** located at a distribution network (e.g., **106***a-c*) receiving power from the grid. The operator of a BTM load may additionally or alternatively charge less than the market rate to consume excess power generated at the generation station during curtailment. As a result, the generation station may direct generated power based on the "best" price that the generation station can receive during a given time frame, and/or the lowest cost the generation station may incur from negative market pricing during curtailment. The "best" price may be the highest price that the generation station may receive for its generated power during a given duration, but can also differ within embodiments and may depend on various factors, such as a prior PPA.

In one example, by having a behind-the-meter option available, a generation station may transition from supplying all generated power to the grid to supplying some or all generated power to one or more BTM loads when the market price paid for power by grid operators drops below a predefined threshold (e.g., the price that the operator of the BTM load is willing to pay the generation station for power). Thus, by having an alternative option for power consumption (i.e., one or more BTM loads), the generation station can selectively utilize the different options to maximize the price received for generated power. In addition, the generation station may also utilize a BTM load to avoid or reduce the economic impact in situations when supplying power to the grid would result in the generation station incurring a net cost.

Providing BTM power to a load can also benefit the BTM load operator. A BTM load may be able to receive and utilize BTM power received from the generation station at a cost that is lower than the cost for power from the grid (e.g., at a customer meter **106***d*, **1060**. This is primarily due to the avoidance (or significant reduction) in T&D costs and the market effects of curtailment. As indicated above, the generation station may be willing to divert generated power to the BTM load rather than supplying the grid due to changing market conditions, or during maintenance periods, or for other non-market conditions. Thus, some situations may arise where the generation station offers power to the BTM load at a price that is substantially lower than the price available on the grid. Furthermore, in some situations, the BTM load may even be able to obtain and utilize BTM power from a generation station at no cost or even at negative pricing since the generation station may rather supply the BTM load with generated power during a given time range instead of paying a higher price for the grid to take the power or modifying operations to decrease power output.

Another example of cost-effective use of BTM power is when the generation station **202** is selling power to the grid at a negative price that is offset by a production tax credit. In certain circumstances, the value of the production tax credit may exceed the price the generation station **202** would have to pay to the grid power to offload generation's station **202** generated power. Advantageously, one or more flexible datacenters **220** may take the generated power behind-the-meter, thereby allowing the generation station **202** to produce and obtain the production tax credit, while selling less power to the grid at the negative price.

Another example of cost-effective behind-the-meter power is when the generation station **202** is selling power to the grid at a negative price because the grid is oversupplied and/or the generation station **202** is instructed to stand down and stop producing altogether. A grid operator may select and direct certain generation stations to go offline and stop supplying power to the grid. Advantageously, one or more flexible datacenters may be used to take power behind-the-meter, thereby allowing the generation station **202** to stop supplying power to the grid, but still stay online and make productive use of the power generated.

Another example of beneficial behind-the-meter power use is when the generation station **202** is producing power that is, with reference to the grid, unstable, out of phase, or at the wrong frequency, or the grid is already unstable, out of phase, or at the wrong frequency. A grid operator may select certain generation stations to go either offline and stop producing power, or to take corrective action with respect to the grid power stability, phase, or frequency. Advantageously, one or more flexible datacenters **220** may be used to selectively consume power behind-the-meter, thereby allowing the generation station **202** to stop providing power to the grid and/or provide corrective feedback to the grid.

Another example of beneficial behind-the-meter power use is that cost-effective behind-the-meter power availability may occur when the generation station **202** is starting up or testing. Individual equipment in the power generation equipment **210** may be routinely offline for installation, maintenance, and/or service and the individual units must be tested prior to coming online as part of overall power generation equipment **210**. During such testing or maintenance time, one or more flexible datacenters may be intermittently

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powered by the one or more units of the power generation equipment **210** that are offline from the overall power generation equipment **210**.

Another example of beneficial behind-the-meter power use is that datacenter control systems at the flexible datacenters **220** may quickly ramp up and ramp down power consumption by computing systems in the flexible datacenters **220** based on power availability from the generation station **202**. For instance, if the grid requires additional power and signals the demand via a higher local price for power, the generation station **202** can supply the grid with power nearly instantly by having active flexible datacenters **220** quickly ramp down and turn off computing systems (or switch to a stored energy source), thereby reducing an active BTM load.

Another example of beneficial behind-the-meter power use is in new photovoltaic generation stations **202**. For example, it is common to design and build new photovoltaic generation stations with a surplus of power capacity to account for degradation in efficiency of the photovoltaic panels over the life of the generation stations. Excess power availability at the generation station can occur when there is excess local power generation and/or low grid demand. In high incident sunlight situations, a photovoltaic generation station **202** may generate more power than the intended capacity of generation station **202**. In such situations, a photovoltaic generation station **202** may have to take steps to protect its equipment from damage, which may include taking one or more photovoltaic panels offline or shunting their voltage to dummy loads or the ground. Advantageously, one or more flexible datacenters (e.g., the flexible datacenters **220**) may take power behind-the-meter at the Generations Station **202**, thereby allowing the generation station **202** to operate the power generation equipment **210** within operating ranges while the flexible datacenters **220** receive BTM power without transmission or distribution costs.

Thus, for at least the reasons described herein, arrangements that involves providing a BTM load as an alternative option for a generation station to direct its generated power to can serve as a mutually beneficial relationship in which both the generation station and the BTM load can economically benefit. The above-noted examples of beneficial use of BTM power are merely exemplary and are not intended to limit the scope of what one of ordinary skill in the art would recognize as benefits to unutilized BTM power capacity, BTM power pricing, or BTM power consumption.

Within example embodiments described herein, various types of utility-scale power producers may operate as generation stations **202** that are capable of supplying power to one or more loads behind-the-meter. For instance, renewable energy sources (e.g., wind, solar, hydroelectric, wave, water current, tidal), fossil fuel power generation sources (coal, natural gas), and other types of power producers (e.g., nuclear power) may be positioned in an arrangement that enables the intermittent supply of generated power behind-the-meter to one or more BTM loads. One of ordinary skill in the art will recognize that the generation station **202** may vary based on an application or design in accordance with one or more example embodiments.

In addition, the particular arrangement (e.g., connections) between the generation station and one or more BTM loads can vary within examples. In one embodiment, a generation station may be positioned in an arrangement wherein the generation station selectively supplies power to the grid and/or to one or more BTM loads. As such, power cost-analysis and other factors (e.g., predicted weather conditions, contractual obligations, etc.) may be used by the generation station, a BTM load control system, a remote master control system, or some other system or enterprise, to selectively output power to either the grid or to one or more BTM loads in a manner that maximizes revenue to the generation station. In such an arrangement, the generation station may also be able to supply both the grid and one or more BTM loads simultaneously. In some instances, the arrangement may be configured to allow dynamic manipulation of the percentage of the overall generated power that is supplied to each option at a given time. For example, in some time periods, the generation station may supply no power to the BTM load.

In addition, the type of loads that are positioned behind-the-meter can vary within example embodiments. In general, a load that is behind-the-meter may correspond to any type of load capable of receiving and utilizing power behind-the-meter from a generation station. Some examples of loads include, but are not limited to, datacenters and electric vehicle (EV) charging stations.

Preferred BTM loads are loads that can be subject to intermittent power supply because BTM power may be available intermittently. In some instances, the generation station may generate power intermittently. For example, wind power station **102***c* and/or photovoltaic power station **102***d* may only generate power when resource are available or favorable. Additionally or alternatively, BTM power availability at a generation station may only be available intermittently due to power market fluctuations, power system conditions (e.g., power factor fluctuation or generation station startup and testing), and/or operational directives from grid operators or generation station operators.

Some example embodiments of BTM loads described herein involve using one or more computing systems to serve as a BTM load at a generation station. In particular, the computing system or computing systems may receive power behind-the-meter from the generation station to perform various computational operations, such as processing or storing information, performing calculations, mining for cryptocurrencies, supporting blockchain ledgers, and/or executing applications, etc.

Multiple computing systems positioned behind-the-meter may operate as part of a "flexible" datacenter that is configured to operate only intermittently and to receive and utilize BTM power to carry out various computational operations similar to a traditional datacenter. In particular, the flexible datacenter may include computing systems and other components (e.g., support infrastructure, a control system) configured to utilize BTM power from one or more generation stations. The flexible datacenter may be configured to use particular load ramping abilities (e.g., quickly increase or decrease power usage) to effectively operate during intermittent periods of time when power is available from a generation station and supplied to the flexible datacenter behind-the-meter, such as during situations when supplying generated power to the grid is not favorable for the generation station.

In some instances, the amount of power consumed by the computing systems at a flexible datacenter can be ramped up and down quickly, and potentially with high granularity (i.e., the load can be changed in small increments if desired). This may be done based on monitored power system conditions or other information analyses as discussed herein. As recited above, this can enable a generation station to avoid negative power market pricing and to respond quickly to grid direc-

tives. And by extension, the flexible datacenter may obtain BTM power at a price lower than the cost for power from the grid.

Various types of computing systems can provide granular power ramping. Preferably, the computing systems can perform computational tasks that are immune to, or not substantially hindered by, frequent interruptions or slow-downs in processing as the computing systems ramp down or up. In some embodiments, a control system may be used to activate or de-activate one or more computing systems in an array of computing systems. For example, the control system may provide control instructions to one or more blockchain miners (e.g., a group of blockchain miners), including instructions for powering on or off, adjusting frequency of computing systems performing operations (e.g., adjusting the processing frequency), adjusting the quantity of operations being performed, and when to operate within a low power mode (if available).

Within examples, a control system may correspond to a specialized computing system or may be a computing system within a datacenter serving in the role of the control system. The location of the control system can vary within examples as well. For instance, the control system may be located at a datacenter or physically separate from the datacenter. In some examples, the control system may be part of a network of control systems that manage computational operations, power consumption, and other aspects of a fleet of datacenters. The fleet of datacenters may include one or more traditional datacenters and/or flexible datacenters.

Some embodiments may involve using one or more control systems to direct time-insensitive (e.g., interruptible) computational tasks to computational hardware, such as central processing units (CPUs) and graphics processing units (GPUs), sited behind the meter, while other hardware is sited in front of the meter (i.e., consuming metered grid power via a customer meter (e.g., **106***d*, **1060**) and possibly remote from the behind-the-meter hardware. As such, parallel computing processes, such as Monte Carlo simulations, batch processing of financial transactions, graphics rendering, machine learning, neural network processing, queued operations, and oil and gas field simulation models, are good candidates for such interruptible computational operations.

FIG. **2** shows a behind-the-meter arrangement with optional grid-power, including one or more flexible datacenters, according to one or more example embodiments. Dark arrows illustrate a typical power delivery direction. Consistent with FIG. **1**, the arrangement illustrates a generation station **202** in the generation segment **102** of a Wide-Area Synchronous Grid. The generation station **202** supplies utility-scale power (typically >50 MW) via a generation power connection **250** to the Point of Interconnection **103** between the generation station **202** and the rest of the grid. Typically, the power supplied on connection **250** may be at 34.5 kV AC, but it may be higher or lower. Depending on the voltage at connection **250** and the voltage at transmission lines **104***a*, a transformer system **203** may step up the power supplied from the generation station **202** to high voltage (e.g., 115 kV+AC) for transmission over connection **252** and onto transmission lines **104***a* of transmission segment **104**. Grid power carried on the transmission segment **104** may be from generation station **202** as well as other generation stations (not shown). Also consistent with FIG. **1**, grid power is consumed at one or more distribution networks, including example distribution network **206**. Grid power may be taken from the transmission lines **104***a* via connector **254** and stepped down to distribution network voltages (e.g., typically 4 kV to 26 kV AC) and sent into the distribution networks, such as distribution network **206** via distribution line **256**. The power on distribution line **256** may be further stepped down (not shown) before entering individual consumer facilities such as a remote master control system **262** and/or traditional datacenters **260** via customer meters **206**A, which may correspond to customer meters **106***d* in FIG. **1**, or customer meters **106***f* in FIG. **1** if the respective consumer facility includes a local customer power system, such as **106***e* (not shown in FIG. **2**).

Consistent with FIG. **1**, power entering the grid from generation station **202** is metered by a utility-scale generation-side meter. A utility-scale generation-side meter **253** is shown on the low side of transformer system **203** and an alternative location is shown as **253**A on the high side of transformer system **203**. Both locations may be considered settlement metering points for the generation station **202** at the POI **103**. Alternatively, a utility-scale generation-side meter for the generation station **202** may be located at another location consistent with the descriptions of such meters provided herein.

Generation station **202** includes power generation equipment **210**, which may include, as examples, wind turbines and/or photovoltaic panels. Power generation equipment **210** may further include other electrical equipment, including but not limited to switches, busses, collectors, inverters, and power unit transformers (e.g., transformers in wind turbines).

As illustrated in FIG. **2**, generation station **202** is configured to connect with BTM equipment which may function as BTM loads. In the illustrated embodiment of FIG. **2**, the BTM equipment includes flexible datacenters **220**. Various configurations to supply BTM power to flexible datacenters **220** within the arrangement of FIG. **2** are described herein.

In one configuration, generated power may travel from the power generation equipment **210** over one or more connectors **230**A, **230**B to one or more electrical busses **240**A, **240**B, respectively. Each of the connectors **230**A, **230**B may be a switched connector such that power may be routed independently to **240**A and/or **240**B. For illustrative purposes only, connector **230**B is shown with an open switch, and connector **230**A is shown with a closed switch, but either or both may be reversed in some embodiments. Aspects of this configuration can be used in various embodiments when BTM power is supplied without significant power conversion to BTM loads.

In various configurations, the busses **240**A and **240**B may be separated by an open switch **240**C or combined into a common bus by a closed switch **240**C.

In another configuration, generated power may travel from the power generation equipment **210** to the high side of a local step-down transformer **214**. The generated power may then travel from the low side of the local step-down transformer **214** over one or more connectors **232**A, **232**B to the one or more electrical busses **240**A, **240**B, respectively. Each of the connectors **232**A, **232**B may be a switched connector such that power may be routed independently to **240**A and/or **240**B. For illustrative purposes only, connector **232**A is shown with an open switch, and connector **232**B is shown with a closed switch, but either or both may be reversed in some embodiments. Aspects of this configuration can be used when it is preferable to connect BTM power to the power generation equipment **210**, but the generated power must be stepped down prior to use at the BTM loads.

In another configuration, generated power may travel from the power generation equipment **210** to the low side of a local step-up transformer **212**. The generated power may

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then travel from the high side of the local step-up transformer **212** over one or more connectors **234**A, **234**B to the one or more electrical busses **240**A, **240**B, respectively. Each of the connectors **234**A, **234**B may be a switched connector such that power may be routed independently to **240**A and/or **240**B. For illustrative purposes only, both connectors **234**A, **234**B are shown with open switches, but either or both may be closed in some embodiments. Aspects of this configuration can be used when it is preferable to connect BTM power to the outbound connector **250** or the high side of the local step-up transformer **212**.

In another configuration, generated power may travel from the power generation equipment **210** to the low side of the local step-up transformer **212**. The generated power may then travel from the high side of the local step-up transformer **212** to the high side of local step-down transformer **213**. The generated power may then travel from the low side of the local step-down transformer **213** over one or more connectors **236**A, **236**B to the one or more electrical busses **240**A, **240**B, respectively. Each of the connectors **236**A, **2346** may be a switched connector such that power may be routed independently to **240**A and/or **240**B. For illustrative purposes only, both connectors **236**A, **236**B are shown with open switches, but either or both may be closed in some embodiments. Aspects of this configuration can be used when it is preferable to connect BTM power to the outbound connector **250** or the high side of the local step-up transformer **212**, but the power must be stepped down prior to use at the BTM loads.

In one embodiment, power generated at the generation station **202** may be used to power a generation station control system **216** located at the generation station **202**, when power is available. The generation station control system **216** may typically control the operation of the generation station **202**. Generated power used at the generation station control system **216** may be supplied from bus **240**A via connector **216**A and/or from bus **240**B via connector **216**B. Each of the connectors **216**A, **216**B may be a switched connector such that power may be routed independently to **240**A and/or **240**B. While the generation station control system **216** can consume BTM power when powered via bus **240**A or bus **240**B, the BTM power taken by generation station control system **216** is insignificant in terms of rendering an economic benefit. Further, the generation station control system **216** is not configured to operate intermittently, as it generally must remain always on. Further still, the generation station control system **216** does not have the ability to quickly ramp a BTM load up or down.

In another embodiment, grid power may alternatively or additionally be used to power the generation station control system **216**. As illustrated here, metered grid power from a distribution network, such as distribution network **206** for simplicity of illustration purposes only, may be used to power generation station control system **216** over connector **216**C. Connector **216**C may be a switched connector so that metered grid power to the generation station control system **216** can be switched on or off as needed. More commonly, metered grid power would be delivered to the generation station control system **216** via a separate distribution network (not shown), and also over a switched connector. Any such grid power delivered to the generation station control system **216** is metered by a customer meter **206**A and subject to T&D costs.

In another embodiment, when power generation equipment **210** is in an idle or off state and not generating power, grid power may backfeed into generation station **202** through POI **103** and such grid power may power the generation station control system **216**.

In some configurations, an energy storage system **218** may be connected to the generation station **202** via connector **218**A, which may be a switched connector. For illustrative purposes only, connector **218**A is shown with an open switch but in some embodiments it may be closed. The energy storage system **218** may be connected to bus **240**A and/or bus **240**B and store energy produced by the power generation equipment **210**. The energy storage system may also be isolated from generation station **202** by switch **242**A. In times of need, such as when the power generation equipment in an idle or off state and not generating power, the energy storage system may feed power to, for example, the flexible datacenters **220**. The energy storage system may also be isolated from the flexible datacenters **220** by switch **242**B.

In a preferred embodiment, as illustrated, power generation equipment **210** supplies BTM power via connector **242** to flexible datacenters **220**. The BTM power used by the flexible datacenters **220** was generated by the generation station **202** and did not pass through the POI **103** or utility-scale generation-side meter **253**, and is not subject to T&D charges. Power received at the flexible datacenters **220** may be received through respective power input connectors **220**A. Each of the respective connectors **220**A may be switched connector that can electrically isolate the respective flexible datacenter **220** from the connector **242**. Power equipment **220**B may be arranged between the flexible datacenters **220** and the connector **242**. The power equipment **220**B may include, but is not limited to, power conditioners, unit transformers, inverters, and isolation equipment. As illustrated, each flexible datacenter **220** may be served by a respective power equipment **220**B. However, in another embodiment, one power equipment **220**B may serve multiple flexible datacenter **220**.

In one embodiment, flexible datacenters **220** may be considered BTM equipment located behind-the-meter and electrically connected to the power generation equipment **210** behind (i.e., prior to) the generation station's POI **103** with the rest of the electrical grid.

In one embodiment, BTM power produced by the power generation equipment **210** is utilized by the flexible datacenters **220** behind (i.e., prior to) the generation station's POI with an electrical grid.

In another embodiment, flexible datacenters **220** may be considered BTM equipment located behind-the-meter as the flexible datacenters **220** are electrically connected to the generation station **202**, and generation station **202** is subject to metering by utility-scale generation-side meter **253** (or **253**A, or another utility-scale generation-side meter), and the flexible datacenters **220** receive power from the generation station **202**, but the power received by the flexible datacenters **220** from the generation station **202** has not passed through a utility-scale generation-side meter. In this embodiment, the utility-scale generation-side meter **253** (or **253**A) for the generation station **202** is located at the generation station's **202** POI **103**. In another embodiment, the utility-scale generation-side meter for the generation station **202** is at a location other than the POI for the generation station **202**—for example, a substation (not shown) between the generation station **202** and the generation station's POI **103**.

In another embodiment, power from the generation station **202** is supplied to the flexible datacenters **220** as BTM power, where power produced at the generation station **202** is subject to metering by utility-scale generation-side meter

253 (or 253A, or another utility-scale generation-side meter), but the BTM power supplied to the flexible datacenters 220 is utilized before being metered at the utility-scale generation-side meter 253 (or 253A, or another utility-scale generation-side meter). In this embodiment, the utility-scale generation-side meter 253 (or 253A) for the generation station 202 is located at the generation station's 202 POI 103. In another embodiment, the utility-scale generation-side meter for the generation station 202 is at a location other than the POI for the generation station 202—for example, a substation (not shown) between the generation station 202 and the generation station's POI 103.

In another embodiment, flexible datacenters 220 may be considered BTM equipment located behind-the-meter as they are electrically connected to the generation station 202 that supplies power to the grid, and the flexible datacenters 220 receive power from the generation station 202 that is not subject to T&D charges, but power otherwise received from the grid that is supplied by the generation station 202 is subject to T&D charges.

In another embodiment, power from the generation station 202 is supplied to the flexible datacenters 220 as BTM power, where electrical power is generated at the generation station 202 that supplies power to a grid, and the generated power is not subject to T&D charges before being used by flexible datacenters 220, but power otherwise received from the connected grid is subject to T&D charges.

In another embodiment, flexible datacenters 220 may be considered BTM equipment located behind-the-meter because they receive power generated from the generation station 202 intended for the grid, and that received power is not routed through the electrical grid before being delivered to the flexible datacenters 220.

In another embodiment, power from the generation station 202 is supplied to the flexible datacenters 220 as BTM power, where electrical power is generated at the generation station 202 for distribution to the grid, and the flexible datacenters 220 receive that power, and that received power is not routed through the electrical grid before being delivered to the flexible datacenters 220.

In another embodiment, metered grid power may alternatively or additionally be used to power one or more of the flexible datacenters 220, or a portion within one or more of the flexible datacenters 220. As illustrated here for simplicity, metered grid power from a distribution network, such as distribution network 206, may be used to power one or more flexible datacenters 220 over connector 256A and/or 256B. Each of connector 256A and/or 256B may be a switched connector so that metered grid power to the flexible datacenters 220 can be switched on or off as needed. More commonly, metered grid power would be delivered to the flexible datacenters 220 via a separate distribution network (not shown), and also over switched connectors. Any such grid power delivered to the flexible datacenters 220 is metered by customer meters 206A and subject to T&D costs. In one embodiment, connector 256B may supply metered grid power to a portion of one or more flexible datacenters 220. For example, connector 256B may supply metered grid power to control and/or communication systems for the flexible datacenters 220 that need constant power and cannot be subject to intermittent BTM power. Connector 242 may supply solely BTM power from the generation station 202 to high power demand computing systems within the flexible datacenters 220, in which case at least a portion of each flexible datacenters 220 so connected is operating as a BTM load. In another embodiment, connector 256A and/or 256B may supply all power used at one or more of the flexible datacenters 220, in which case each of the flexible datacenters 220 so connected would not be operating as a BTM load.

In another embodiment, when power generation equipment 210 is in an idle or off state and not generating power, grid power may backfeed into generation station 202 through POI 103 and such grid power may power the flexible datacenters 220.

The flexible datacenters 220 are shown in an example arrangement relative to the generation station 202. Particularly, generated power from the generation station 202 may be supplied to the flexible datacenters 220 through a series of connectors and/or busses (e.g., 232B, 240B, 242, 220A). As illustrated, in other embodiments, connectors between the power generation equipment 210 and other components may be switched open or closed, allowing other pathways for power transfer between the power generation equipment 210 and components, including the flexible datacenters 220. Additionally, the connector arrangement shown is illustrative only and other circuit arrangements are contemplated within the scope of supplying BTM power to a BTM load at generation station 202. For example, there may be more or fewer transformers, or one or more of transformers 212, 213, 214 may be transformer systems with multiple steppings and/or may include additional power equipment including but not limited to power conditioners, filters, switches, inverters, and/or AC/DC-DC/AC isolators. As another example, metered grid power connections to flexible datacenters 220 are shown via both 256A and 256B; however, a single connection may connect one or more flexible datacenters 220 (or power equipment 220B) to metered grid power and the one or more flexible datacenters 220 (or power equipment 220B) may include switching apparatus to direct BTM power and/or metered grid power to control systems, communication systems, and/or computing systems as desired.

In some examples, BTM power may arrive at the flexible datacenters 220 in a three-phase AC format. As such, power equipment (e.g., power equipment 220B) at one or more of the flexible datacenters 220 may enable each flexible datacenter 220 to use one or more phases of the power. For instance, the flexible datacenters 220 may utilize power equipment (e.g., power equipment 220B, or alternatively or additionally power equipment that is part of the flexible datacenter 220) to convert BTM power received from the generation station 202 for use at computing systems at each flexible datacenter 220. In other examples, the BTM power may arrive at one or more of the flexible datacenters 220 as DC power. As such, the flexible datacenters 220 may use the DC power to power computing systems. In some such examples, the DC power may be routed through a DC-to-DC converter that is part of power equipment 220B and/or flexibles datacenter 220.

In some configurations, a flexible datacenter 220 may be arranged to only have access to power received behind-the-meter from a generation station 202. In the arrangement of FIG. 2, the flexible datacenters 220 may be arranged only with a connection to the generation station 202 and depend solely on power received behind-the-meter from the generation station 202. Alternatively or additionally, the flexible datacenters 220 may receive power from energy storage system 218.

In some configurations, one or more of the flexible datacenters 220 can be arranged to have connections to multiple sources that are capable of supplying power to a flexible datacenter 220. To illustrate a first example, the flexible datacenters 220 are shown connected to connector 242, which can be connected or disconnected via switches to

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the energy storage system **218** via connector **218**A, the generation station **202** via bus **240**B, and grid power via metered connector **256**A. In one embodiment, the flexible datacenters **220** may selectively use power received behind-the-meter from the generation station **202**, stored power supplied by the energy storage system **218**, and/or grid power. For instance, flexible datacenters **220** may use power stored in the energy storage system **218** when costs for using power supplied behind-the-meter from the generation station **202** are disadvantageous. By having access to the energy storage system **218** available, the flexible datacenters **220** may use the stored power and allow the generation station **202** to subsequently refill the energy storage system **218** when cost for power behind-the-meter is low. Alternatively, the flexible datacenters **220** may use power from multiple sources simultaneously to power different components (e.g., a first set and a second set of computing systems). Thus, the flexible datacenters **220** may leverage the multiple connections in a manner that can reduce the cost for power used by the computing systems at the flexible datacenters **220**. The flexible datacenters **220** control system or the remote master control system **262** may monitor power conditions and other factors to determine whether the flexible datacenters **220** should use power from either the generation station **202**, grid power, the energy storage system **218**, none of the sources, or a subset of sources during a given time range. Other arrangements are possible as well. For example, the arrangement of FIG. **2** illustrates each flexible datacenter **220** as connected via a single connector **242** to energy storage system **218**, generation station **202**, and metered grid power via **256**A. However, one or more flexible datacenters **220** may have independent switched connections to each energy source, allowing the one or more flexible datacenters **220** to operate from different energy sources than other flexible datacenters **220** at the same time.

The selection of which power source to use at a flexible datacenter (e.g., the flexible datacenters **220**) or another type of BTM load can change based on various factors, such as the cost and availability of power from both sources, the type of computing systems using the power at the flexible datacenters **220** (e.g., some systems may require a reliable source of power for a long period), the nature of the computational operations being performed at the flexible datacenters **220** (e.g., a high priority task may require immediate completion regardless of cost), and temperature and weather conditions, among other possible factors. As such, a datacenter control system at the flexible datacenters **220**, the remote master control system **262**, or another entity (e.g., an operator at the generation station **202**) may also influence and/or determine the source of power that the flexible datacenters **220** use at a given time to complete computational operations.

In some example embodiments, the flexible datacenters **220** may use power from the different sources to serve different purposes. For example, the flexible datacenters **220** may use metered power from grid power to power one or more systems at the flexible datacenters **220** that are configured to be always-on (or almost always on), such as a control and/or communication system and/or one or more computing systems (e.g., a set of computing systems performing highly important computational operations). The flexible datacenters **220** may use BTM power to power other components within the flexible datacenters **220**, such as one or more computing systems that perform less critical computational operations.

In some examples, one or more flexible datacenters **220** may be deployed at the generation station **202**. In other examples, flexible datacenters **220** may be deployed at a location geographically remote from the generation station **202**, while still maintaining a BTM power connection to the generation station **202**.

In another example arrangement, the generation station **202** may be connected to a first BTM load (e.g., a flexible datacenter **220**) and may supply power to additional BTM loads via connections between the first BTM load and the additional BTM loads (e.g., a connection between a flexible datacenter **220** and another flexible datacenter **220**).

The arrangement in FIG. **2**, and components included therein, are for non-limiting illustration purposes and other arrangements are contemplated in examples. For instance, in another example embodiment, the arrangement of FIG. **2** may include more or fewer components, such as more BTM loads, different connections between power sources and loads, and/or a different number of datacenters. In addition, some examples may involve one or more components within the arrangement of FIG. **2** being combined or further divided.

Within the arrangement of FIG. **2**, a control system, such as the remote master control system **262** or another component (e.g., a control system associated with the grid operator, the generation station control system **216**, or a datacenter control system associated with a traditional datacenter or one or more flexible datacenters) may use information to efficiently manage various operations of some of the components within the arrangement of FIG. **2**. For example, the remote master control system **262** or another component may manage distribution and execution of computational operations at one or more traditional datacenters **260** and/or flexible datacenters **220** via one or more information-processing algorithms. These algorithms may utilize past and current information in real-time to manage operations of the different components. These algorithms may also make some predictions based on past trends and information analysis. In some examples, multiple computing systems may operate as a network to process information.

Information used to make decisions may include economic and/or power-related information, such as monitored power system conditions. Monitored power system conditions may include one or more of excess power generation at a generation station **202**, excess power at a generation station **202** that a connected grid cannot receive, power generation at a generation station **202** subject to economic curtailment, power generation at a generation station **202** subject to reliability curtailment, power generation at a generation station **202** subject to power factor correction, low power generation at a generation station **202**, start up conditions at a generation station **202**, transient power generation conditions at a generation station **202**, or testing conditions where there is an economic advantage to using behind-the-meter power generation at a generation station **202**. These different monitored power system conditions can be weighted differently during processing and analysis.

In some examples, the information can include the cost for power from available sources (e.g., BTM power at the generation station **202** versus metered grid power) to enable comparisons to be made which power source costs less. In some instances, the information may include historic prices for power to enable the remote master control system **262** or another system to predict potential future prices in similar situations (e.g., the cost of power tends to trend upwards for grid power during warmer weather and peak-use hours). The information may also indicate the availability of power from the various sources (e.g., BTM power at the generation

station **262**, the energy storage system **218** at the generation station **262**, and/or metered grid power).

In addition, the information may also include other data, including information associated with operations at components within the arrangement. For instance, the information may include data associated with performance of operations at the flexible datacenters **220** and the traditional datacenters **260**, such as the number of computational tasks currently being performed, the types of tasks being performed (e.g., type of computational operation, time-sensitivity, etc.), the number, types, and capabilities of available computing systems, the amount of computational tasks awaiting performance, and the types of computing systems at one or more datacenters, among others. The information may also include data specifying the conditions at one or more datacenters (e.g., whether or not the temperatures are in a desired range, the amount of power available within an energy storage system such as **218**), the amount of computational tasks awaiting performance in the queue of one or more of the datacenters, and the identities of the entities associated with the computational operations at one or more of the datacenters. Entities associated with computational operations may be, for example, owners of the datacenters, customers who purchase computational time at the datacenters, or other entities.

The information used by the remote master control system **262** or another component may include data associated with the computational operations to be performed, such as deadlines, priorities (e.g., high vs. low priority tasks), cost to perform based on required computing systems, the optimal computing systems (e.g., CPU vs GPU vs ASIC; processing unit capabilities, speeds, or frequencies, or instructional sets executable by the processing units) for performing each requested computational task, and prices each entity (e.g., company) is willing to pay for computational operations to be performed or otherwise supported via computing systems at a traditional datacenter **260** or a flexible datacenter **220**, among others. In addition, the information may also include other data (e.g., weather conditions at locations of datacenters or power sources, any emergencies associated with a datacenter or power source, or the current value of bids associated with an auction for computational tasks).

The information may be updated in-real time and used to make the different operational decisions within the arrangement of FIG. **2**. For instance, the information may help a component (e.g., the remote master control system **262** or a control system at a flexible datacenter **220**) determine when to ramp up or ramp down power use at a flexible datacenter **220** or when to switch one or more computing systems at a flexible datacenter **220** into a low power mode or to operate at a different frequency, among other operational adjustments. The information can additionally or alternatively help a component within the arrangement of FIG. **2** to determine when to transfer computational operations between computing systems or between datacenters based on various factors. In some instances, the information may also be used to determine when to temporarily stop performing a computational operation or when to perform a computational operation at multiple sites for redundancy or other reasons. The information may further be used to determine when to accept new computational operations from entities or when to temporarily suspend accepting new tasks to be performed due to lack of computing system availability.

The remote master control system **262** represents a computing system that is capable of obtaining, managing, and using the information described above to manage and oversee one or more operations within the arrangement of FIG. **2**. As such, the remote master control system **262** may be one or more computing systems configured to process all, or a subset of, the information described above, such as power, environment, computational characterization, and economic factors to assist with the distribution and execution of computing operations among one or more datacenters. For instance, the remote master control system **262** may be configured to obtain and delegate computational operations among one or more datacenters based on a weighted analysis of a variety of factors, including one or more of the cost and availability of power, the types and availability of the computing systems at each datacenter, current and predicted weather conditions at the different locations of flexible datacenters (e.g., flexible datacenters **220**) and generation stations (e.g., generation stations **202**), levels of power storage available at one or more energy storage systems (e.g., energy storage system **218**), and deadlines and other attributes associated with particular computational operations, among other possible factors. As such, the analysis of information performed by the remote master control system **262** may vary within examples. For instance, the remote master control system **262** may use real-time information to determine whether or not to route a computational operation to a particular flexible datacenter (e.g., a flexible datacenter **220**) or to transition a computational operation between datacenters (e.g., from traditional datacenter **260** to a flexible datacenter **220**).

As shown in FIG. **2**, the generation station **202** may be able to supply power to the grid and/or BTM loads such as flexible datacenters **220**. With such a configuration, the generation station **202** may selectively provide power to the BTM loads and/or the grid based on economic and power availability considerations. For example, the generation station **202** may supply power to the grid when the price paid for the power exceeds a particular threshold (e.g., the power price offered by operators of the flexible datacenters **220**). In some instances, the operator of a flexible datacenter and the operator of a generation station capable of supplying BTM power to the flexible datacenter may utilize a predefined arrangement (e.g., a contract) that specifies a duration and/or price range when the generation station may supply power to the flexible datacenter.

The remote master control system **262** may be capable of directing one or more flexible datacenters **220** to ramp-up or ramp-down to desired power consumption levels, and/or to control cooperative action of multiple flexible datacenters by determining how to power each individual flexible datacenter **220** in accordance with operational directives.

The configuration of the remote master control system **262** can vary within examples as further discussed with respect to FIGS. **2**, **3**, and **7-9**. The remote master control system **262** may operate as a single computing system or may involve a network of computing systems. Preferably, the remote master control system **262** is implemented across one or more servers in a fault-tolerant operating environment that ensures continuous uptime and connectivity by virtue of its distributed nature. Alternatively, although the remote master control system **262** is shown as a physically separate component arrangement for FIG. **2**, the remote master control system **262** may be combined with another component in other embodiments. To illustrate an example, the remote master control system **262** may operate as part of a flexible datacenter (e.g., a computing system or a datacenter control system of the flexible datacenter **220**), includ-

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ing sharing components with a flexible datacenter, sharing power with a flexible datacenter, and/or being co-located with a flexible datacenter.

In addition, the remote master control system **262** may communicate with components within the arrangement of FIG. **2** using various communication technologies, including wired and wireless communication technologies. For instance, the remote master control system **262** may use wired (not illustrated) or wireless communication to communicate with datacenter control systems or other computing systems at the flexible datacenters **220** and the traditional datacenters **260**. The remote master control system **262** may also communicate with entities inside or outside the arrangement of FIG. **2** and other components within the arrangement of FIG. **2** via wired or wireless communication. For instance, the remote master control system **262** may use wireless communication to obtain computational operations from entities seeking support for the computational operations at one or more datacenters in exchange for payment. The remote master control system **262** may communicate directly with the entities or may obtain the computational operations from the traditional datacenters **260**. For instance, an entity may submit jobs (e.g., computational operations) to one or more traditional datacenters **260**. The remote master control system **262** may determine that transferring one or more of the computational operations to a flexible datacenter **220** may better support the transferred computational operations. For example, the remote master control system **262** may determine that the transfer may enable the computational operations to be completed quicker and/or at a lower cost. In some examples, the remote master control system **262** may communicate with the entity to obtain approval prior to transferring the one or more computational operations.

The remote master control system **262** may also communicate with grid operators and/or an operator of generation station **202** to help determine power management strategies when distributing computational operations across the various datacenters. In addition, the remote master control system **262** may communicate with other sources, such as weather prediction systems, historical and current power price databases, and auction systems, etc.

In further examples, the remote master control system **262** or another computing system within the arrangement of FIG. **2** may use wired or wireless communication to submit bids within an auction that involves a bidder (e.g., the highest bid) obtaining computational operations or other tasks to be performed. Particularly, the remote master control system **262** may use the information discussed above to develop bids to obtain computing operations for performance at available computing systems at flexible datacenters (e.g., flexible datacenters **220**).

In the example arrangement shown in FIG. **2**, the flexible datacenters **220** represent example loads that can receive power behind-the-meter from the generation station **202**. In such a configuration, the flexible datacenters **220** may obtain and utilize power behind-the-meter from the generation station **202** to perform various computational operations. Performance of a computational operation may involve one or more computing systems providing resources useful in the computational operation. For instance, the flexible datacenters **220** may include one or more computing systems configured to store information, perform calculations and/or parallel processes, perform simulations, mine cryptocurrencies, and execute applications, among other potential tasks. The computing systems can be specialized or generic and can be arranged at each flexible datacenter **220** in a variety of ways (e.g., straight configuration, zig-zag configuration) as further discussed with respect to FIGS. **6**A, **6**B. Furthermore, although the example arrangement illustrated in FIG. **2** shows configurations where flexible datacenters **220** serve as BTM loads, other types of loads can be used as BTM loads within examples.

The arrangement of FIG. **2** includes the traditional datacenters **260** coupled to metered grid power. The traditional datacenters **260** using metered grid power to provide computational resources to support computational operations. One or more enterprises may assign computational operations to the traditional datacenters **260** with expectations that the datacenters reliably provide resources without interruption (i.e., non-intermittently) to support the computational operations, such as processing abilities, networking, and/or volatile storage. Similarly, one or more enterprises may also request computational operations to be performed by the flexible datacenters **220**. The flexible datacenters **220** differ from the traditional datacenters **260** in that the flexible datacenters **220** are arranged and/or configured to be connected to BTM power, are expected to operate intermittently, and are expected to ramp load (and thus computational capability) up or down regularly in response to control directives. In some examples, the flexible datacenters **220** and the traditional datacenters **260** may have similar configurations and may only differ based on the source(s) of power relied upon to power internal computing systems. Preferably, however, the flexible datacenters **220** include particular fast load ramping abilities (e.g., quickly increase or decrease power usage) and are intended and designed to effectively operate during intermittent periods of time.

FIG. **3** shows a block diagram of the remote master control system **300** according to one or more example embodiments. Remote master control system **262** may take the form of remote master control system **300**, or may include less than all components in remote master control system **300**, different components than in remote master control system **300**, and/or more components than in remote master control system **300**.

The remote master control system **300** may perform one or more operations described herein and may include a processor **302**, a data storage unit **304**, a communication interface **306**, a user interface **308**, an operations and environment analysis module **310**, and a queue system **312**. In other examples, the remote master control system **300** may include more or fewer components in other possible arrangements.

As shown in FIG. **3**, the various components of the remote master control system **300** can be connected via one or more connection mechanisms (e.g., a connection mechanism **314**). In this disclosure, the term "connection mechanism" means a mechanism that facilitates communication between two or more devices, systems, components, or other entities. For instance, a connection mechanism can be a simple mechanism, such as a cable, PCB trace, or system bus, or a relatively complex mechanism, such as a packet-based communication network (e.g., LAN, WAN, and/or the Internet). In some instances, a connection mechanism can include a non-tangible medium (e.g., where the connection is wireless).

As part of the arrangement of FIG. **2**, the remote master control system **300** (corresponding to remote master control system **262**) may perform a variety of operations, such as management and distribution of computational operations among datacenters, monitoring operational, economic, and environment conditions, and power management. For instance, the remote master control system **300** may obtain

computational operations from one or more enterprises for performance at one or more datacenters. The remote master control system **300** may subsequently use information to distribute and assign the computational operations to one or more datacenters (e.g., the flexible datacenters **220**) that have the resources (e.g., particular types of computing systems and available power) available to complete the computational operations. In some examples, the remote master control system **300** may assign all incoming computational operation requests to the queue system **312** and subsequently assign the queued requests to computing systems based on an analysis of current market and power conditions.

Although the remote master control system **300** is shown as a single entity, a network of computing systems may perform the operations of the remote master control system **300** in some examples. For example, the remote master control system **300** may exist in the form of computing systems (e.g., datacenter control systems) distributed across multiple datacenters.

The remote master control system **300** may include one or more processors **302**. As such, the processor **302** may represent one or more general-purpose processors (e.g., a microprocessor) and/or one or more special-purpose processors (e.g., a digital signal processor (DSP)). In some examples, the processor **302** may include a combination of processors within examples. The processor **302** may perform operations, including processing data received from the other components within the arrangement of FIG. **2** and data obtained from external sources, including information such as weather forecasting systems, power market price systems, and other types of sources or databases.

The data storage unit **304** may include one or more volatile, non-volatile, removable, and/or non-removable storage components, such as magnetic, optical, or flash storage, and/or can be integrated in whole or in part with the processor **302**. As such, the data storage unit **304** may take the form of a non-transitory computer-readable storage medium, having stored thereon program instructions (e.g., compiled or non-compiled program logic and/or machine code) that, when executed by the processor **302**, cause the remote master control system **300** to perform one or more acts and/or functions, such as those described in this disclosure. Such program instructions can define and/or be part of a discrete software application. In some instances, the remote master control system **300** can execute program instructions in response to receiving an input, such as from the communication interface **306**, the user interface **308**, or the operations and environment analysis module **310**. The data storage unit **304** may also store other information, such as those types described in this disclosure.

In some examples, the data storage unit **304** may serve as storage for information obtained from one or more external sources. For example, data storage unit **304** may store information obtained from one or more of the traditional datacenters **260**, a generation station **202**, a system associated with the grid, and flexible datacenters **220**. As examples only, data storage **304** may include, in whole or in part, local storage, dedicated server-managed storage, network attached storage, and/or cloud-based storage, and/or combinations thereof.

The communication interface **306** can allow the remote master control system **300** to connect to and/or communicate with another component according to one or more protocols. For instance, the communication interface **306** may be used to obtain information related to current, future, and past prices for power, power availability, current and predicted weather conditions, and information regarding the different datacenters (e.g., current workloads at datacenters, types of computing systems available within datacenters, price to obtain power at each datacenter, levels of power storage available and accessible at each datacenter, etc.). In an example, the communication interface **306** can include a wired interface, such as an Ethernet interface or a high-definition serial-digital-interface (HD-SDI). In another example, the communication interface **406** can include a wireless interface, such as a cellular, satellite, WiMAX, or WI-FI interface. A connection can be a direct connection or an indirect connection, the latter being a connection that passes through and/or traverses one or more components, such as such as a router, switcher, or other network device. Likewise, a wireless transmission can be a direct transmission or an indirect transmission. The communication interface **306** may also utilize other types of wireless communication to enable communication with datacenters positioned at various locations.

The communication interface **306** may enable the remote master control system **300** to communicate with the components of the arrangement of FIG. **2**. In addition, the communication interface **306** may also be used to communicate with the various datacenters, power sources, and different enterprises submitting computational operations for the datacenters to support.

The user interface **308** can facilitate interaction between the remote master control system **300** and an administrator or user, if applicable. As such, the user interface **308** can include input components such as a keyboard, a keypad, a mouse, a touch-sensitive panel, a microphone, and/or a camera, and/or output components such as a display device (which, for example, can be combined with a touch-sensitive panel), a sound speaker, and/or a haptic feedback system. More generally, the user interface **308** can include hardware and/or software components that facilitate interaction between remote master control system **300** and the user of the system.

In some examples, the user interface **308** may enable the manual examination and/or manipulation of components within the arrangement of FIG. **2**. For instance, an administrator or user may use the user interface **308** to check the status of, or change, one or more computational operations, the performance or power consumption at one or more datacenters, the number of tasks remaining within the queue system **312**, and other operations. As such, the user interface **308** may provide remote connectivity to one or more systems within the arrangement of FIG. **2**.

The operations and environment analysis module **310** represents a component of the remote master control system **300** associated with obtaining and analyzing information to develop instructions/directives for components within the arrangement of FIG. **2**. The information analyzed by the operations and environment analysis module **310** can vary within examples and may include the information described above with respect predicting and/or directing the use of BTM power. For instance, the operations and environment analysis module **310** may obtain and access information related to the current power state of computing systems operating as part of the flexible datacenters **220** and other datacenters that the remote master control system **300** has access to. This information may be used to determine when to adjust power usage or mode of one or more computing systems. In addition, the remote master control system **300** may provide instructions a flexible datacenter **220** to cause a subset of the computing systems to transition into a low power mode to consume less power while still performing

operations at a slower rate. The remote master control system **300** may also use power state information to cause a set of computing systems at a flexible datacenter **220** to operate at a higher power consumption mode. In addition, the remote master control system **300** may transition computing systems into sleep states or power on/off based on information analyzed by the operations and environment analysis module **310**.

In some examples, the operations and environment analysis module **310** may use location, weather, activity levels at the flexible datacenters or the generation station, and power cost information to determine control strategies for one or more components in the arrangement of FIG. **2**. For instance, the remote master control system **300** may use location information for one or more datacenters to anticipate potential weather conditions that could impact access to power. In addition, the operations and environment analysis module **310** may assist the remote master control system **300** determine whether to transfer computational operations between datacenters based on various economic and power factors.

The queue system **312** represents a queue capable of organizing computational operations to be performed by one or more datacenters. Upon receiving a request to perform a computational operation, the remote master control system **300** may assign the computational operation to the queue until one or more computing systems are available to support the computational operation. The queue system **312** may be used for organizing and transferring computational tasks in real time.

The organizational design of the queue system **312** may vary within examples. In some examples, the queue system **312** may organize indications (e.g., tags, pointers) to sets of computational operations requested by various enterprises. The queue system **312** may operate as a First-In-First-Out (FIFO) data structure. In a FIFO data structure, the first element added to the queue will be the first one to be removed. As such, the queue system **312** may include one or more queues that operate using the FIFO data structure.

In some examples, one or more queues within the queue system **312** may use other designs of queues, including rules to rank or organize queues in a particular manner that can prioritize some sets of computational operations over others. The rules may include one or more of an estimated cost and/or revenue to perform each set of computational operations, an importance assigned to each set of computational operations, and deadlines for initiating or completing each set of computational operations, among others. Examples using a queue system are further described below with respect to FIG. **9**.

In some examples, the remote master control system **300** may be configured to monitor one or more auctions to obtain computational operations for datacenters to support. Particularly, the remote master control system **300** may use resource availability and power prices to develop and submit bids to an external or internal auction system for the right to support particular computational operations. As a result, the remote master control system **300** may identify computational operations that could be supported at one or more flexible datacenters **220** at low costs.

FIG. **4** is a block diagram of a generation station **400**, according to one or more example embodiments. Generation station **202** may take the form of generation station **400**, or may include less than all components in generation station **400**, different components than in generation station **400**, and/or more components than in generation station **400**. The generation station **400** includes power generation equipment **401**, a communication interface **408**, a behind-the-meter interface **406**, a grid interface **404**, a user interface **410**, a generation station control system **414**, and power transformation equipment **402**. The power generation equipment **210** may take the form of power generation equipment **401**, or may include less than all components in power generation equipment **401**, different components than in power generation equipment **401**, and/or more components than in power generation equipment **401**. Generation station control system **216** may take the form of generation station control system **414**, or may include less than all components in generation station control system **414**, different components than in generation station control system **414**, and/or more components than in generation station control system **414**. Some or all of the components generation station **400** may be connected via a communication interface **516**. These components are illustrated in FIG. **4** to convey an example configuration for the generation station **400** (corresponding to generation station **202** shown in FIG. **2**). In other examples, the generation station **400** may include more or fewer components in other arrangements.

The generation station **400** can correspond to any type of grid-connected utility-scale power producer capable of supplying power to one or more loads. The size, amount of power generated, and other characteristics of the generation station **400** may differ within examples. For instance, the generation station **400** may be a power producer that provides power intermittently. The power generation may depend on monitored power conditions, such as weather at the location of the generation station **400** and other possible conditions. As such, the generation station **400** may be a temporary arrangement, or a permanent facility, configured to supply power. The generation station **400** may supply BTM power to one or more loads and supply metered power to the electrical grid. Particularly, the generation station **400** may supply power to the grid as shown in the arrangement of FIG. **2**.

The power generation equipment **401** represents the component or components configured to generate utility-scale power. As such, the power generation equipment **401** may depend on the type of facility that the generation station **400** corresponds to. For instance, the power generation equipment **401** may correspond to electric generators that transform kinetic energy into electricity. The power generation equipment **401** may use electromagnetic induction to generate power. In other examples, the power generation equipment **401** may utilize electrochemistry to transform chemical energy into power. The power generation equipment **401** may use the photovoltaic effect to transform light into electrical energy. In some examples, the power generation equipment **401** may use turbines to generate power. The turbines may be driven by, for example, wind, water, steam or burning gas. Other examples of power production are possible.

The communication interface **408** can enable the generation station **400** to communicate with other components within the arrangement of FIG. **2**. As such, the communication interface **408** may operate similarly to the communication interface **306** of the remote master control system **300** and the communication interface **503** of the flexible datacenter **500**.

The generation station control system **414** may be one or more computing systems configured to control various aspects of the generation station **400**.

The BTM interface **406** is a module configured to enable the power generation equipment **401** to supply BTM power to one or more loads and may include multiple components.

The arrangement of the BTM interface **406** may differ within examples based on various factors, such as the number of flexible datacenters **220** (or **500**) coupled to the generation station **400**, the proximity of the flexible datacenters **220** (or **500**), and the type of generation station **400**, among others. In some examples, the BTM interface **406** may be configured to enable power delivery to one or more flexible datacenters positioned near the generation station **400**. Alternatively, the BTM interface **406** may also be configured to enable power delivery to one or more flexible datacenters **220** (or **500**) positioned remotely from the generation station **400**.

The grid interface **404** is a module configured to enable the power generation equipment **401** to supply power to the grid and may include multiple components. As such, the grid interface **404** may couple to one or more transmission lines (e.g., transmission lines **404***a* shown in FIG. **2**) to enable delivery of power to the grid.

The user interface **410** represents an interface that enables administrators and/or other entities to communicate with the generation station **400**. As such, the user interface **410** may have a configuration that resembles the configuration of the user interface **308** shown in FIG. **3**. An operator may utilize the user interface **410** to control or monitor operations at the generation station **400**.

The power transformation equipment **402** represents equipment that can be utilized to enable power delivery from the power generation equipment **401** to the loads and to transmission lines linked to the grid. Example power transformation equipment **402** includes, but is not limited to, transformers, inverters, phase converters, and power conditioners.

FIG. **5** shows a block diagram of a flexible datacenter **500**, according to one or more example embodiments. Flexible datacenters **220** may take the form of flexible datacenter **500**, or may include less than all components in flexible datacenter **500**, different components than in flexible datacenter **500**, and/or more components than in flexible datacenter **500**. In the example embodiment shown in FIG. **5**, the flexible datacenter **500** includes a power input system **502**, a communication interface **503**, a datacenter control system **504**, a power distribution system **506**, a climate control system **508**, one or more sets of computing systems **512**, and a queue system **514**. These components are shown connected by a communication bus **528**. In other embodiments, the configuration of flexible datacenter **500** can differ, including more or fewer components. In addition, the components within flexible datacenter **500** may be combined or further divided into additional components within other embodiments.

The example configuration shown in FIG. **5** represents one possible configuration for a flexible datacenter. As such, each flexible datacenter may have a different configuration when implemented based on a variety of factors that may influence its design, such as location and temperature that the location, particular uses for the flexible datacenter, source of power supplying computing systems within the flexible datacenter, design influence from an entity (or entities) that implements the flexible datacenter, and space available for the flexible datacenter. Thus, the embodiment of flexible datacenter **220** shown in FIG. **2** represents one possible configuration for a flexible datacenter out of many other possible configurations.

The flexible datacenter **500** may include a design that allows for temporary and/or rapid deployment, setup, and start time for supporting computational operations. For instance, the flexible datacenter **500** may be rapidly deployed at a location near a source of generation station power (e.g., near a wind farm or solar farm). Rapid deployment may involve positioning the flexible datacenter **500** at a target location and installing and/or configuring one or more racks of computing systems within. The racks may include wheels to enable swift movement of the computing systems. Although the flexible datacenter **500** could theoretically be placed anywhere, transmission losses may be minimized by locating it proximate to BTM power generation.

The physical construction and layout of the flexible datacenter **500** can vary. In some instances, the flexible datacenter **500** may utilize a metal container (e.g., a metal container **602** shown in FIG. **6**A). In general, the flexible datacenter **500** may utilize some form of secure weatherproof housing designed to protect interior components from wind, weather, and intrusion. The physical construction and layout of example flexible datacenters are further described with respect to FIGS. **6**A-**6**B.

Within the flexible datacenter **500**, various internal components enable the flexible datacenter **500** to utilize power to perform some form of operations. The power input system **502** is a module of the flexible datacenter **500** configured to receive external power and input the power to the different components via assistance from the power distribution system **506**. As discussed with respect to FIG. **2**, the sources of external power feeding a flexible datacenter can vary in both quantity and type (e.g., the generation stations **202**, **400**, grid-power, energy storage systems). Power input system **502** includes a BTM power input sub-system **522**, and may additionally include other power input sub-systems (e.g., a grid-power input sub-system **524** and/or an energy storage input sub-system **526**). In some instances, the quantity of power input sub-systems may depend on the size of the flexible datacenter and the number and/or type of computing systems being powered. In an example embodiment, the flexible datacenter may use grid power as the primary power supply.

In some embodiments, the power input system **502** may include some or all of flexible datacenter Power Equipment **220**B. The power input system **502** may be designed to obtain power in different forms (e.g., single phase or three-phase behind-the-meter alternating current ("AC") voltage, and/or direct current ("DC") voltage). As shown, the power input system **502** includes a BTM power input sub-system **522**, a grid power input sub-system **524**, and an energy input sub-system **526**. These sub-systems are included to illustrate example power input sub-systems that the flexible datacenter **500** may utilize, but other examples are possible. In addition, in some instances, these sub-systems may be used simultaneously to supply power to components of the flexible datacenter **500**. The sub-systems may also be used based on available power sources.

In some implementations, the BTM power input sub-system **522** may include one or more AC-to-AC step-down transformers used to step down supplied medium-voltage AC to low voltage AC (e.g., 120V to 600V nominal) used to power computing systems **512** and/or other components of flexible datacenter **500**. The power input system **502** may also directly receive single-phase low voltage AC from a generation station as BTM power, from grid power, or from a stored energy system such as energy storage system **218**. In some implementations, the power input system **502** may provide single-phase AC voltage to the datacenter control system **504** (and/or other components of flexible datacenter **500**) independent of power supplied to computing systems **512** to enable the datacenter control system **504** to perform

management operations for the flexible datacenter **500**. For instance, the grid power input sub-system **524** may use grid power to supply power to the datacenter control system **504** to ensure that the datacenter control system **504** can perform control operations and communicate with the remote master control system **300** (or **262**) during situations when BTM power is not available. As such, the datacenter control system **504** may utilize power received from the power input system **502** to remain powered to control the operation of flexible datacenter **500**, even if the computational operations performed by the computing system **512** are powered intermittently. In some instances, the datacenter control system **504** may switch into a lower power mode to utilize less power while still maintaining the ability to perform some functions.

The power distribution system **506** may distribute incoming power to the various components of the flexible datacenter **500**. For instance, the power distribution system **506** may direct power (e.g., single-phase or three-phase AC) to one or more components within flexible datacenter **500**. In some embodiments, the power distribution system **506** may include some or all of flexible datacenter Power Equipment **220**B.

In some examples, the power input system **502** may provide three phases of three-phase AC voltage to the power distribution system **506**. The power distribution system **506** may controllably provide a single phase of AC voltage to each computing system or groups of computing systems **512** disposed within the flexible datacenter **500**. The datacenter control system **504** may controllably select which phase of three-phase nominal AC voltage that power distribution system **506** provides to each computing system **512** or groups of computing systems **512**. This is one example manner in which the datacenter control system **504** may modulate power delivery (and load at the flexible datacenter **500**) by ramping-up flexible datacenter **500** to fully operational status, ramping-down flexible datacenter **500** to offline status (where only datacenter control system **504** remains powered), reducing load by withdrawing power delivery from, or reducing power to, one or more of the computing systems **512** or groups of the computing systems **512**, or modulating power factor correction for the generation station **300** (or **202**) by controllably adjusting which phases of three-phase nominal AC voltage are used by one or more of the computing systems **512** or groups of the computing systems **512**. The datacenter control system **504** may direct power to certain sets of computing systems based on computational operations waiting for computational resources within the queue system **514**. In some embodiments, the flexible datacenter **500** may receive BTM DC power to power the computing systems **512**.

One of ordinary skill in the art will recognize that a voltage level of three-phase AC voltage may vary based on an application or design and the type or kind of local power generation. As such, a type, kind, or configuration of the operational AC-to-AC step down transformer (not shown) may vary based on the application or design. In addition, the frequency and voltage level of three-phase AC voltage, single-phase AC voltage, and DC voltage may vary based on the application or design in accordance with one or more embodiments.

As discussed above, the datacenter control system **504** may perform operations described herein, such as dynamically modulating power delivery to one or more of the computing systems **512** disposed within flexible datacenter **500**. For instance, the datacenter control system **504** may modulate power delivery to one or more of the computing systems **512** based on various factors, such as BTM power availability or an operational directive from a generation station **262** or **300** control system, a remote master control system **262** or **300**, or a grid operator. In some examples, the datacenter control system **504** may provide computational operations to sets of computing systems **512** and modulate power delivery based on priorities assigned to the computational operations. For instance, an important computational operation (e.g., based on a deadline for execution and/or price paid by an entity) may be assigned to a particular computing system or set of computing systems **512** that has the capacity, computational abilities to support the computational operation. In addition, the datacenter control system **504** may also prioritize power delivery to the computing system or set of computing systems **512**.

In some example, the datacenter control system **504** may further provide directives to one or more computing systems to change operations in some manner. For instance, the datacenter control system **504** may cause one or more computing systems **512** to operate at a lower or higher frequency, change clock cycles, or operate in a different power consumption mode (e.g., a low power mode). These abilities may vary depending on types of computing systems **512** available at the flexible datacenter **500**. As a result, the datacenter control system **504** may be configured to analyze the computing systems **512** available either on a periodic basis (e.g., during initial set up of the flexible datacenter **500**) or in another manner (e.g., when a new computational operation is assigned to the flexible datacenter **500**).

The datacenter control system **504** may also implement directives received from the remote master control system **262** or **300**. For instance, the remote master control system **262** or **300** may direct the flexible datacenter **500** to switch into a low power mode. As a result, one or more of the computing systems **512** and other components may switch to the low power mode in response.

The datacenter control system **504** may utilize the communication interface **503** to communicate with the remote master control system **262** or **300**, other datacenter control systems of other datacenters, and other entities. As such, the communication interface **503** may include components and operate similar to the communication interface **306** of the remote master control system **300** described with respect to FIG. **4**.

The flexible datacenter **500** may also include a climate control system **508** to maintain computing systems **512** within a desired operational temperature range. The climate control system **508** may include various components, such as one or more air intake components, an evaporative cooling system, one or more fans, an immersive cooling system, an air conditioning or refrigerant cooling system, and one or more air outtake components. One of ordinary skill in the art will recognize that any suitable heat extraction system configured to maintain the operation of computing systems **512** within the desired operational temperature range may be used.

The flexible datacenter **500** may further include an energy storage system **510**. The energy storage system **510** may store energy for subsequent use by computing systems **512** and other components of flexible datacenter **500**. For instance, the energy storage system **510** may include a battery system. The battery system may be configured to convert AC voltage to DC voltage and store power in one or more storage cells. In some instances, the battery system may include a DC-to-AC inverter configured to convert DC

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voltage to AC voltage, and may further include an AC phase-converter, to provide AC voltage for use by flexible datacenter **500**.

The energy storage system **510** may be configured to serve as a backup source of power for the flexible datacenter **500**. For instance, the energy storage system **510** may receive and retain power from a BTM power source at a low cost (or no cost at all). This low-cost power can then be used by the flexible datacenter **500** at a subsequent point, such as when BTM power costs more. Similarly, the energy storage system **510** may also store energy from other sources (e.g., grid power). As such, the energy storage system **510** may be configured to use one or more of the sub-systems of the power input system **502**.

In some examples, the energy storage system **510** may be external to the flexible datacenter **500**. For instance, the energy storage system **510** may be an external source that multiple flexible datacenters utilize for back-up power.

The computing systems **512** represent various types of computing systems configured to perform computational operations. Performance of computational operations include a variety of tasks that one or more computing systems may perform, such as data storage, calculations, application processing, parallel processing, data manipulation, cryptocurrency mining, and maintenance of a distributed ledger, among others. As shown in FIG. **5**, the computing systems **512** may include one or more CPUs **516**, one or more GPUs **518**, and/or one or more Application-Specific Integrated Circuits (ASIC's) **520**. Each type of computing system **512** may be configured to perform particular operations or types of operations.

Due to different performance features and abilities associated with the different types of computing systems, the datacenter control system **504** may determine, maintain, and/or relay this information about the types and/or abilities of the computing systems, quantity of each type, and availability to the remote master control system **262** or **300** on a routine basis (e.g., periodically or on-demand). This way, the remote master control system **262** or **300** may have current information about the abilities of the computing systems **512** when distributing computational operations for performance at one or more flexible datacenters. Particularly, the remote master control system **262** or **300** may assign computational operations based on various factors, such as the types of computing systems available and the type of computing systems required by each computing operation, the availability of the computing systems, whether computing systems can operate in a low power mode, and/or power consumption and/or costs associated with operating the computing systems, among others.

The quantity and arrangement of these computing systems **512** may vary within examples. In some examples, the configuration and quantity of computing systems **512** may depend on various factors, such as the computational tasks that are performed by the flexible datacenter **500**. In other examples, the computing systems **512** may include other types of computing systems as well, such as DSPs, SIMDs, neural processors, and/or quantum processors.

As indicated above, the computing systems **512** can perform various computational operations, including in different configurations. For instance, each computing system may perform a particular computational operation unrelated to the operations performed at other computing systems. Groups of the computing systems **512** may also be used to work together to perform computational operations.

In some examples, multiple computing systems may perform the same computational operation in a redundant configuration. This redundant configuration creates a back-up that prevents losing progress on the computational operation in situations of a computing failure or intermittent operation of one or more computing systems. In addition, the computing systems **512** may also perform computational operations using a check point system. The check point system may enable a first computing system to perform operations up to a certain point (e.g., a checkpoint) and switch to a second computing system to continue performing the operations from that certain point. The check point system may also enable the datacenter control system **504** to communicate statuses of computational operations to the remote master control system **262** or **300**. This can further enable the remote master control system **262 300** to transfer computational operations between different flexible datacenters allowing computing systems at the different flexible datacenters to resume support of computational operations based on the check points.

The queue system **514** may operate similar to the queue system **312** of the remote master control system **300** shown in FIG. **3**. Particularly, the queue system **514** may help store and organize computational tasks assigned for performance at the flexible datacenter **500**. In some examples, the queue system **514** may be part of a distributed queue system such that each flexible datacenter in a fleet of flexible datacenter includes a queue, and each queue system **514** may be able to communicate with other queue systems. In addition, the remote master control system **262** or **300** may be configured to assign computational tasks to the queues located at each flexible datacenter (e.g., the queue system **514** of the flexible datacenter **500**). As such, communication between the remote master control system **262** or **300** and the datacenter control system **504** and/or the queue system **514** may allow organization of computational operations for the flexible datacenter **500** to support.

FIG. **6**A shows another structural arrangement for a flexible datacenter, according to one or more example embodiments. The particular structural arrangement shown in FIG. **6**A may be implemented at flexible datacenter **500**. The illustration depicts the flexible datacenter **500** as a mobile container **702** equipped with the power input system **502**, the power distribution system **506**, the climate control system **508**, the datacenter control system **504**, and the computing systems **512** arranged on one or more racks **604**. These components of flexible datacenter **500** may be arranged and organized according to an example structural region arrangement. As such, the example illustration represents one possible configuration for the flexible datacenter **500**, but others are possible within examples.

As discussed above, the structural arrangement of the flexible datacenter **500** may depend on various factors, such as the ability to maintain temperature within the mobile container **602** within a desired temperature range. The desired temperature range may depend on the geographical location of the mobile container **602** and the type and quantity of the computing systems **512** operating within the flexible datacenter **500** as well as other possible factors. As such, the different design elements of the mobile container **602** including the inner contents and positioning of components may depend on factors that aim to maximize the use of space within mobile container **602**, lower the amount of power required to cool the computing systems **512**, and make setup of the flexible datacenter **500** efficient. For instance, a first flexible datacenter positioned in a cooler geographic region may include less cooling equipment than a second flexible datacenter positioned in a warmer geographic region.

As shown in FIG. **6**A, the mobile container **602** may be a storage trailer disposed on permanent or removable wheels and configured for rapid deployment. In other embodiments, the mobile container **602** may be a storage container (not shown) configured for placement on the ground and potentially stacked in a vertical or horizontal manner (not shown). In still other embodiments, the mobile container **602** may be an inflatable container, a floating container, or any other type or kind of container suitable for housing a mobile flexible datacenter. As such, the flexible datacenter **500** may be rapidly deployed on site near a source of unutilized behind-the-meter power generation. And in still other embodiments, the flexible datacenter **500** might not include a mobile container. For example, the flexible datacenter **500** may be situated within a building or another type of stationary environment.

FIG. **6**B shows the computing systems **512** in a straight-line configuration for installation within the flexible datacenter **500**, according to one or more example embodiments. As indicated above, the flexible datacenter **500** may include a plurality of racks **604**, each of which may include one or more computing systems **512** disposed therein. As discussed above, the power input system **502** may provide three phases of AC voltage to the power distribution system **506**. In some examples, the power distribution system **506** may controllably provide a single phase of AC voltage to each computing system **512** or group of computing systems **512** disposed within the flexible datacenter **500**. As shown in FIG. **6**B, for purposes of illustration only, eighteen total racks **604** are divided into a first group of six racks **606**, a second group of six racks **608**, and a third group of six racks **610**, where each rack contains eighteen computing systems **512**. The power distribution system (**506** of FIG. **5**) may, for example, provide a first phase of three-phase AC voltage to the first group of six racks **606**, a second phase of three-phase AC voltage to the second group of six racks **608**, and a third phase of three-phase AC voltage to the third group of six racks **610**. In other embodiments, the quantity of racks and computing systems can vary.

FIG. **7** shows a control distribution system **700** of the flexible datacenter **500** according to one or more example embodiments. The system **700** includes a grid operator **702**, a generation station control system **216**, a remote master control system **300**, and a flexible datacenter **500**. As such, the system **700** represents one example configuration for controlling operations of the flexible datacenter **500**, but other configurations may include more or fewer components in other arrangements.

The datacenter control system **504** may independently or cooperatively with one or more of the generation station control system **414**, the remote master control system **300**, and/or the grid operator **702** modulate power at the flexible datacenter **500**. During operations, the power delivery to the flexible datacenter **500** may be dynamically adjusted based on conditions or operational directives. The conditions may correspond to economic conditions (e.g., cost for power, aspects of computational operations to be performed), power-related conditions (e.g., availability of the power, the sources offering power), demand response, and/or weather-related conditions, among others.

The generation station control system **414** may be one or more computing systems configured to control various aspects of a generation station (not independently illustrated, e.g., **216** or **400**). As such, the generation station control system **414** may communicate with the remote master control system **300** over a networked connection **706** and with the datacenter control system **704** over a networked or other data connection **708**.

As discussed with respect to FIGS. **2** and **3**, the remote master control system **300** can be one or more computing systems located offsite, but connected via a network connection **710** to the datacenter control system **504**. The remote master control system **300** may provide supervisory controls or override control of the flexible datacenter **500** or a fleet of flexible datacenters (not shown).

The grid operator **702** may be one or more computing systems that are configured to control various aspects of the power grid (not independently illustrated) that receives power from the generation station. The grid operator **702** may communicate with the generation station control system **300** over a networked or other data connection **712**.

The datacenter control system **504** may monitor BTM power conditions at the generation station and determine when a datacenter ramp-up condition is met. The BTM power availability may include one or more of excess local power generation, excess local power generation that the grid cannot accept, local power generation that is subject to economic curtailment, local power generation that is subject to reliability curtailment, local power generation that is subject to power factor correction, conditions where the cost for power is economically viable (e.g., low cost to obtain power), low priced power, situations where local power generation is prohibitively low, start up situations, transient situations, or testing situations where there is an economic advantage to using locally generated behind-the-meter power generation, specifically power available at little to no cost and with no associated transmission or distribution losses or costs. For example, a datacenter control system may analyze future workload and near term weather conditions at the flexible datacenter.

In some instances, the datacenter ramp-up condition may be met if there is sufficient behind-the-meter power availability and there is no operational directive from the generation station control system **414**, the remote master control system **300**, or the grid operator **702** to go offline or reduce power. As such, the datacenter control system **504** may enable 714 the power input system **502** to provide power to the power distribution system **506** to power the computing systems **512** or a subset thereof.

The datacenter control system **504** may optionally direct one or more computing systems **512** to perform predetermined computational operations (e.g., distributed computing processes). For example, if the one or more computing systems **512** are configured to perform blockchain hashing operations, the datacenter control system **504** may direct them to perform blockchain hashing operations for a specific blockchain application, such as, for example, Bitcoin, Litecoin, or Ethereum. Alternatively, one or more computing systems **512** may be configured to perform high-throughput computing operations and/or high performance computing operations.

The remote master control system **300** may specify to the datacenter control system **504** what sufficient behind-the-meter power availability constitutes, or the datacenter control system **504** may be programmed with a predetermined preference or criteria on which to make the determination independently. For example, in certain circumstances, sufficient behind-the-meter power availability may be less than that required to fully power the entire flexible datacenter **500**. In such circumstances, the datacenter control system **504** may provide power to only a subset of computing systems, or operate the plurality of computing systems in a

lower power mode, that is within the sufficient, but less than full, range of power that is available. In addition, the computing systems **512** may adjust operational frequency, such as performing more or less processes during a given duration. The computing systems **512** may also adjust internal clocks via over-clocking or under-clocking when performing operations.

While the flexible datacenter **500** is online and operational, a datacenter ramp-down condition may be met when there is insufficient or anticipated to be insufficient, behind-the-meter power availability or there is an operational directive from the generation station control system **414**, the remote master control system **300**, or the grid operator **702**. The datacenter control system **504** may monitor and determine when there is insufficient, or anticipated to be insufficient, behind-the-meter power availability. As noted above, sufficiency may be specified by the remote master control system **300** or the datacenter control system **504** may be programmed with a predetermined preference or criteria on which to make the determination independently.

An operational directive may be based on current dispatch-ability, forward looking forecasts for when behind-the-meter power is, or is expected to be, available, economic considerations, reliability considerations, operational considerations, or the discretion of the generation station control system **414**, the remote master control system **300**, or the grid operator **702**. For example, the generation station control system **414**, the remote master control system **300**, or the grid operator **702** may issue an operational directive to flexible datacenter **500** to go offline and power down. When the datacenter ramp-down condition is met, the datacenter control system **504** may disable power delivery to the plurality of computing systems (e.g., **512**). The datacenter control system **504** may disable **714** the power input system **502** from providing power (e.g., three-phase nominal AC voltage) to the power distribution system **506** to power down the computing systems **512** while the datacenter control system **504** remains powered and is capable of returning service to operating mode at the flexible datacenter **500** when behind-the-meter power becomes available again.

While the flexible datacenter **500** is online and operational, changed conditions or an operational directive may cause the datacenter control system **504** to modulate power consumption by the flexible datacenter **500**. The datacenter control system **504** may determine, or the generation station control system **414**, the remote master control system **300**, or the grid operator **702** may communicate, that a change in local conditions may result in less power generation, availability, or economic feasibility, than would be necessary to fully power the flexible datacenter **500**. In such situations, the datacenter control system **504** may take steps to reduce or stop power consumption by the flexible datacenter **500** (other than that required to maintain operation of datacenter control system **504**).

Alternatively, the generation station control system **414**, the remote master control system **300**, or the grid operator **702**, may issue an operational directive to reduce power consumption for any reason, the cause of which may be unknown. In response, the datacenter control system **504** may dynamically reduce or withdraw power delivery to one or more computing systems **512** to meet the dictate. The datacenter control system **504** may controllably provide three-phase nominal AC voltage to a smaller subset of computing systems (e.g., **512**) to reduce power consumption. The datacenter control system **504** may dynamically reduce the power consumption of one or more computing systems by reducing their operating frequency or forcing them into a lower power mode through a network directive.

Similarly, the flexible datacenter **500** may ramp up power consumption based on various conditions. For instance, the datacenter control system **504** may determine, or the generation control system **414**, the remote master control system **300**, or the grid operator **702** may communicate, that a change in local conditions may result in greater power generation, availability, or economic feasibility. In such situations, the datacenter control system **504** may take steps to increase power consumption by the flexible datacenter **500**.

Alternatively, the generation station control system **414**, the remote master control system **300**, or the grid operator **702**, may issue an operational directive to increase power consumption for any reason, the cause of which may be unknown. In response, the datacenter control system **504** may dynamically increase power delivery to one or more computing systems **512** (or operations at the computing systems **512**) to meet the dictate. For instance, one or more computing systems **512** may transition into a higher power mode, which may involve increasing power consumption and/or operation frequency.

One of ordinary skill in the art will recognize that datacenter control system **504** may be configured to have a number of different configurations, such as a number or type or kind of the computing systems **512** that may be powered, and in what operating mode, that correspond to a number of different ranges of sufficient and available behind-the-meter power. As such, the datacenter control system **504** may modulate power delivery over a variety of ranges of sufficient and available unutilized behind-the-meter power availability.

FIG. **8** shows a control distribution system **800** of a fleet of flexible datacenters according to one or more example embodiments. The control distribution system **800** of the flexible datacenter **500** shown and described with respect to FIG. **7** may be extended to a fleet of flexible datacenters as illustrated in FIG. **8**. For example, a first generation station (not independently illustrated), such as a wind farm, may include a first plurality of flexible datacenters **802**, which may be collocated or distributed across the generation station. A second generation station (not independently illustrated), such as another wind farm or a solar farm, may include a second plurality of flexible datacenters **804**, which may be collocated or distributed across the generation station. One of ordinary skill in the art will recognize that the number of flexible datacenters deployed at a given station and the number of stations within the fleet may vary based on an application or design in accordance with one or more example embodiments.

The remote master control system **300** may provide directive to datacenter control systems of the fleet of flexible datacenters in a similar manner to that shown and described with respect to FIG. **7**, with the added flexibility to make high level decisions with respect to fleet that may be counterintuitive to a given station. The remote master control system **300** may make decisions regarding the issuance of operational directives to a given generation station based on, for example, the status of each generation station where flexible datacenters are deployed, the workload distributed across fleet, and the expected computational demand required for one or both of the expected workload and predicted power availability. In addition, the remote master control system **300** may shift workloads from the first plurality of flexible datacenters **802** to the second plurality of flexible datacenters **804** for any reason, including, for

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example, a loss of BTM power availability at one generation station and the availability of BTM power at another generation station. As such, the remote master control system **300** may communicate with the generation station control systems **806**A, **806**B to obtain information that can be used to organize and distribute computational operations to the fleets of flexible datacenters **802**, **804**.

FIG. **9** shows a queue distribution arrangement for a traditional datacenter **902** and a flexible datacenter **500**, according to one or more example embodiments. The arrangement of FIG. **9** includes a flexible datacenter **500**, a traditional datacenter **902**, a queue system **312**, a set of communication links **916**, **918**, **920**A, **920**B, and the remote master control system **300**. The arrangement of FIG. **9** represents an example configuration scheme that can be used to distribute computing operations using a queue system **312** between the traditional datacenter **902** and one or more flexible datacenters. In other examples, the arrangement of FIG. **9** may include more or fewer components in other potential configurations. For instance, the arrangement of FIG. **9** may not include the queue system **312** or may include routes that bypass the queue system **312**.

The arrangement of FIG. **9** may enable computational operations requested to be performed by entities (e.g., companies). As such, the arrangement of FIG. **9** may use the queue system **312** to organize incoming computational operations requests to enable efficient distribution to the flexible datacenter **500** and the critical traditional datacenter **902**. Particularly, the arrangement of FIG. **9** may use the queue system **312** to organize sets of computational operations thereby increasing the speed of distribution and performance of the different computational operations among datacenters. As a result, the use of the queue system **312** may reduce time to complete operations and reduce costs.

In some examples, one or more components, such as the datacenter control system **504**, the remote master control system **300**, the queue system **312**, or the control system **936**, may be configured to identify situations that may arise where using the flexible datacenter **500** can reduce costs or increase productivity of the system, as compared to using the traditional datacenter **902** for computational operations. For example, a component within the arrangement of FIG. **9** may identify when using behind-the-meter power to power the computing systems **512** within the flexible datacenter **500** is at a lower cost compared to using the computing systems **934** within the traditional datacenter **902** that are powered by grid power. Additionally, a component in the arrangement of FIG. **9** may be configured to determine situations when offloading computational operations from the traditional datacenter **902** indirectly (i.e., via the queue system **312**) or directly (i.e., bypassing the queue system **312**) to the flexible datacenter **500** can increase the performance allotted to the computational operations requested by an entity (e.g., reduce the time required to complete time-sensitive computational operations).

In some examples, the datacenter control system **504** may monitor activity of the computing systems **512** within the flexible datacenter **500** and use the respective activity levels to determine when to obtain computational operations from the queue system **312**. For instance, the datacenter control system **504** may analyze various factors prior to requesting or accessing a set of computational operations or an indication of the computational operations for the computing systems **512** to perform. The various factors may include power availability at the flexible datacenter **500** (e.g., either stored or from a BTM source), availability of the computing systems **512** (e.g., percentage of computing systems available), type of computational operations available, estimated cost to perform the computational operations at the flexible datacenter **500**, cost for power, cost for power relative to cost for grid power, and instructions from other components within the system, among others. The datacenter control system **504** may analyze one or more of the factors when determining whether to obtain a new set of computational operations for the computing systems **512** to perform. In such a configuration, the datacenter control system **504** manages the activity of the flexible datacenter **500**, including determining when to acquire new sets of computational operations when capacity among the computing systems **512** permit.

In other examples, a component (e.g., the remote master control system **300**) within the system may assign or distribute one or more sets of computational operations organized by the queue system **312** to the flexible datacenter **500**. For example, the remote master control system **300** may manage the queue system **312**, including the distribution of computational operations organized by the queue system **312** to the flexible datacenter **500** and the traditional datacenter **902**. The remote master control system **300** may utilize to information described with respect to the Figures above to determine when to assign computational operations to the flexible datacenter **500**.

The traditional datacenter **902** may include a power input system **930**, a power distribution system **932**, a datacenter control system **936**, and a set of computing systems **934**. The power input system **930** may be configured to receive power from a power grid and distribute the power to the computing systems **934** via the power distribution system **932**. The datacenter control system **936** may monitor activity of the computing systems **934** and obtain computational operations to perform from the queue system **312**. The datacenter control system **936** may analyze various factors prior to requesting or accessing a set of computational operations or an indication of the computational operations for the computing systems **934** to perform. A component (e.g., the remote master control system **300**) within the arrangement of FIG. **9** may assign or distribute one or more sets of computational operations organized by the queue system **312** to the traditional datacenter **902**.

The communication link **916** represents one or more links that may serve to connect the flexible datacenter **500**, the traditional datacenter **902**, and other components within the system (e.g., the remote master control system **300**, the queue system **312**—connections not shown). In particular, the communication link **916** may enable direct or indirect communication between the flexible datacenter **500** and the traditional datacenter **902**. The type of communication link **916** may depend on the locations of the flexible datacenter **500** and the traditional datacenter **902**. Within embodiments, different types of communication links can be used, including but not limited to WAN connectivity, cloud-based connectivity, and wired and wireless communication links.

The queue system **312** represents an abstract data type capable of organizing computational operation requests received from entities. As each request for computational operations are received, the queue system **312** may organize the request in some manner for subsequent distribution to a datacenter. Different types of queues can make up the queue system **312** within embodiments. The queue system **312** may be a centralized queue that organizes all requests for computational operations. As a centralized queue, all incoming requests for computational operations may be organized by the centralized queue.

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In other examples, the queue system **312** may be distributed consisting of multiple queue sub-systems. In the distributed configuration, the queue system **312** may use multiple queue sub-systems to organize different sets of computational operations. Each queue sub-system may be used to organize computational operations based on various factors, such as according to deadlines for completing each set of computational operations, locations of enterprises submitting the computational operations, economic value associated with the completion of computational operations, and quantity of computing resources required for performing each set of computational operations. For instance, a first queue sub-system may organize sets of non-intensive computational operations and a second queue sub-system may organize sets of intensive computational operations. In some examples, the queue system **312** may include queue sub-systems located at each datacenter. This way, each datacenter (e.g., via a datacenter control system) may organize computational operations obtained at the datacenter until computing systems are able to start executing the computational operations. In some examples, the queue system **312** may move computational operations between different computing systems or different datacenters in real-time.

Within the arrangement of FIG. **9**, the queue system **312** is shown connected to the remote master control system **300** via the communication link **918**. In addition, the queue system **312** is also shown connected to the flexible datacenter via the communication **920**A and to the traditional datacenter **902** via the communication link **920**B. The communication links **918**, **920**A, **920**B may be similar to the communication link **916** and can be various types of communication links within examples.

The queue system **312** may include a computing system configured to organize and maintain queues within the queue system **312**. In another example, one or more other components of the system may maintain and support queues within the queue system **312**. For instance, the remote master control system **300** may maintain and support the queue system **312**. In other examples, multiple components may maintain and support the queue system **312** in a distributed manner, such as a blockchain configuration.

In some embodiments, the remote master control system **300** may serve as an intermediary that facilitates all communication between flexible datacenter **500** and the traditional datacenter **902**. Particularly, the traditional datacenter **902** or the flexible datacenter **500** might need to transmit communications to the remote master control system **300** in order to communicate with the other datacenter. As also shown, the remote master control system **300** may connect to the queue system **312** via the communication link **918**. Computational operations may be distributed between the queue system **312** and the remote master control system **300** via the communication link **918**. The computational operations may be transferred in real-time and mid-performance from one datacenter to another (e.g., from the traditional datacenter **902** to the flexible datacenter **500**). In addition, the remote master control system **300** may manage the queue system **312**, including providing resources to support queues within the queue system **312**.

As a result, the remote master control system **300** may offload some or all of the computational operations assigned to the traditional datacenter **902** to the flexible datacenter **500**. This way, the flexible datacenter **500** can reduce overall computational costs by using the behind-the-meter power to provide computational resources to assist traditional datacenter **902**. The remote master control system **300** may use the queue system **312** to temporarily store and organize the offloaded computational operations until a flexible datacenter (e.g., the flexible datacenter **500**) is available to perform them. The flexible datacenter **500** consumes behind-the-meter power without transmission or distribution costs, which lowers the costs associated with performing computational operations originally assigned to the traditional datacenter **902**. The remote master control system **300** may further communicate with the flexible datacenter **500** via communication link **922** and the traditional datacenter **902** via the communication link **924**.

FIG. **10**A shows method **1000** of dynamic power consumption at a flexible datacenter using behind-the-meter power according to one or more example embodiments. Other example methods may be used to manipulate the power delivery to one or more flexible datacenters.

In step **1010**, the datacenter control system, the remote master control system, or another computing system may monitor behind-the-meter power availability. In some embodiments, monitoring may include receiving information or an operational directive from the generation station control system or the grid operator corresponding to behind-the-meter power availability.

In step **1020**, the datacenter control system or the remote master control system **300** may determine when a datacenter ramp-up condition is met. In some embodiments, the datacenter ramp-up condition may be met when there is sufficient behind-the-meter power availability and there is no operational directive from the generation station to go offline or reduce power.

In step **1030**, the datacenter control system may enable behind-the-meter power delivery to one or more computing systems. In some instances, the remote mater control system may directly enable BTM power delivery to computing systems within the flexible system without instructing the datacenter control system.

In step **1040**, once ramped-up, the datacenter control system or the remote master control system may direct one or more computing systems to perform predetermined computational operations. In some embodiments, the predetermined computational operations may include the execution of one or more distributed computing processes, parallel processes, and/or hashing functions, among other types of processes.

While operational, the datacenter control system, the remote master control system, or another computing system may receive an operational directive to modulate power consumption. In some embodiments, the operational directive may be a directive to reduce power consumption. In such embodiments, the datacenter control system or the remote master control system may dynamically reduce power delivery to one or more computing systems or dynamically reduce power consumption of one or more computing systems. In other embodiments, the operational directive may be a directive to provide a power factor correction factor. In such embodiments, the datacenter control system or the remote master control system may dynamically adjust power delivery to one or more computing systems to achieve a desired power factor correction factor. In still other embodiments, the operational directive may be a directive to go offline or power down. In such embodiments, the datacenter control system may disable power delivery to one or more computing systems.

FIG. **10**B shows method **1050** of dynamic power delivery to a flexible datacenter using behind-the-meter power according to one or more embodiments. In step **1060**, the datacenter control system or the remote master control system may monitor behind-the-meter power availability. In

certain embodiments, monitoring may include receiving information or an operational directive from the generation station control system or the grid operator corresponding to behind-the-meter power availability.

In step **1070**, the datacenter control system or the remote master control system may determine when a datacenter ramp-down condition is met. In certain embodiments, the datacenter ramp-down condition may be met when there is insufficient behind-the-meter power availability or anticipated to be insufficient behind-the-meter power availability or there is an operational directive from the generation station to go offline or reduce power.

In step **1080**, the datacenter control system may disable behind-the-meter power delivery to one or more computing systems. In step **1090**, once ramped-down, the datacenter control system remains powered and in communication with the remote master control system so that it may dynamically power the flexible datacenter when conditions change.

One of ordinary skill in the art will recognize that a datacenter control system may dynamically modulate power delivery to one or more computing systems of a flexible datacenter based on behind-the-meter power availability or an operational directive. The flexible datacenter may transition between a fully powered down state (while the datacenter control system remains powered), a fully powered up state, and various intermediate states in between. In addition, flexible datacenter may have a blackout state, where all power consumption, including that of the datacenter control system is halted. However, once the flexible datacenter enters the blackout state, it will have to be manually rebooted to restore power to datacenter control system. Generation station conditions or operational directives may cause flexible datacenter to ramp-up, reduce power consumption, change power factor, or ramp-down.

FIG. **11** illustrates a block diagram of a system for implementing control strategies based on a power option agreement, according to one or more embodiments. The system **1100** represents an example arrangement that includes a control system (e.g., the remote master control system **262**), a load (e.g., one or more of the datacenters **1102**, **1104**, and **1106**), and a power entity **1140**, which may establish and operate in accordance with a power option agreement. Additional arrangements are possible within examples.

In general, a power option agreement is an agreement between a power entity **1140** associated with the delivery of power to a load (e.g., a grid operator, power generation station, or local control station) and the load (e.g., the datacenters **1102-1106**). As part of the power option agreement, the load (e.g., load operator, contracting agent for the load, semi-automated control system associated with the load, and/or automated control system associated with the load) provides the power entity **1140** with the right, but not obligation, to reduce the amount of power delivered (e.g., grid power) to the load up to an agreed amount of power during an agreed upon time interval. In order to provide the power entity **1140** with this option, the load needs to be using at least the amount of power subject to the option (e.g., a minimum power threshold). For instance, the load may agree to use at least 1 MW of grid power at all times during a specified 24-hour time interval to provide the power entity **1140** with the option of being able to reduce the amount of power delivered to the load by any amount up to 1 MW at any point during the specified 24-hour time interval. The load may grant the power entity **1140** with this option in exchange for a monetary consideration (e.g., receive power at a reduced price and/or monetary payment if the option is exercised by the power entity).

The power option agreement may be used by the power entity **1140** to reserve the right to reduce the amount of grid power delivered to the load during a set time frame (e.g., the next 24 hours). For instance, the power entity **1140** may exercise a predefined power option to reduce the amount of grid power delivered to the load during a time when the grid power may be better redirected to other loads coupled to the power grid. As such, the power entity **1140** may exercise power option agreements to balance loads coupled to the power grid. In some embodiments, a power option agreement may also specify other parameters, such as costs associated with different levels of power consumption and/or maximum power thresholds for the load to operate according to.

To illustrate an example, a power option agreement may specify that a load (e.g., the datacenters **1102-1106**) is required to use at least 10 MW or more at all times during the next 12 hours. Thus, the minimum power threshold according to the power option agreement is 10 MW and this minimum power threshold extends across the time interval of the next 12 hours. In order to comply with the agreement, the load must subsequently operate using 10 MW or more power at all times during the next 12 hours. This way, the load can accommodate a situation where the power entity **1140** exercises the option. Particularly, exercising the option may trigger the load to reduce the amount of power it consumes by an amount up to 10 MW at any point during the 12 hour interval. By establishing this power option agreement, the power entity **1140** can manipulate the amount of power consumed at the load during the next 12 hours by up to 10 MW if power needs to be redirected to another load or a reduction in power consumption is needed for other reasons.

In the example arrangement of the system **1100** shown in FIG. **11**, one or more of the datacenters (e.g., the flexible datacenters **1102**, **1104**, and the traditional datacenter **1106**) may operate as the load that is subject to a power option agreement. As the load that is subject to the power option agreement, the datacenters **1102-1106** may execute control instructions in accordance with power target consumption targets that meet or exceed the minimum power thresholds based on the power option agreement.

As shown in FIG. **11**, each datacenter **1102-1106** may include a set of computing systems configured to perform computational operations using power from one or more power sources (e.g., BTM power, grid power, and/or grid power subject to a power option agreement). In particular, the flexible datacenter **1102** includes computing systems **1108** arranged into a first set **1114**A, a second set **1114**B, and a third set **1114**C, the flexible datacenter **1104** includes computing systems **1110** arranged into a first set **1116**A, a second set **1116**B, and a third set **1118**B, and the traditional datacenter **1106** includes computing systems **1112** arranged into a first set **1118**A, a second set **1118**B, and a third set **1118**C. Each set of computing systems may include various types of computing systems that can operate in one or more modes.

The different sets of computing systems as well as the multiple datacenters are included in FIG. **11** for illustration purposes. In particular, the variety of computing systems represent different configurations that a load may take while operating in accordance with a power option agreement, and each configuration (as detailed herein) may include ramping up or down power consumption and transferring and performing computational operations between sets of comput-

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ing systems and/or datacenters. In other examples, the load that is subject to a power option agreement may take on other configurations (e.g., a single datacenter **1102-1106**, and/or a single set of computing systems).

The remote master control system **262** may serve as a control system that can determine performance strategies and provide control instructions to the load (e.g., one or more of the datacenters **1102-1106**). In particular, the remote master control system **262** can monitor conditions in concert with the minimum power thresholds and time intervals (e.g., power option data) set forth in, and/or derived from, one or more power option agreements to determine performance strategies that can enable the load to meet the expectations of the power option agreement(s) while also efficiently using power to accomplish computational operations. In some instances, the remote master control system **262** may also be subject to the power option agreement and may adjust its own power consumption based on the power option agreement (e.g., ramp up or down power consumption based on the defined minimum power thresholds during time intervals).

To establish a power option agreement, the remote master control system **262** (or another computing system) may communicate with the power entity **1140**. For instance, the remote master control system **262** may provide a request (e.g., a signal and/or a bid) to the power entity **1140** and receive the terms of one or more power option agreements, or power option data related to power option agreements (e.g., data such as minimum power thresholds and time intervals, but not all terms contained within a potential power option agreement) in response. In some examples, the remote master control system **262** may evaluate one or more conditions prior to establishing a power option agreement to ensure that the conditions could enable the load (e.g., the datacenters **1102-1106**) to operate in accordance with the power option agreement. For instance, the remote master control system **262** may check the quantity and deadlines associated with computational operations assigned to specific datacenters prior to establishing specific datacenters as a load subject to a power option agreement. In some cases, multiple power option agreements may be established. For example, each datacenter **1102-1106** may be subject to a different power option agreement, which may result in the remote master control system **262** managing the power consumption at each of the datacenters **1102-1106** differently.

Within the system **1100** shown in FIG. **11**, the power entity **1140** may represent any type of power entity associated with the delivery of power to the load that is subject to a power option agreement. For instance, the power entity **1140** may be a local station control system, a grid operator, or a power generation source. As such, the power entity **1140** may establish power option agreements with the loads via communication with the loads and/or the remote master control system **262**. For example, the power entity **1140** may obtain and accept a bid from a load trying to engage in a power option agreement with the power entity **1140**. The power entity **1140** is shown with a power option module **1142**, which may be used to establish power option agreements (e.g., fixed-duration 1144 and/or dynamic **1146**).

Once a power option agreement is established, the remote master control system **262** may obtain power option data from the power entity **1140** (or another source) that specifies the power and time expectations of the power entity **1140**. As shown in FIG. **11**, the power entity **1140** includes a power option module **1142**, which may be used to provide power option data to the remote master control system **262** and/or the datacenters **1102-1106**. In particular, the power option data may specify the minimum power threshold or thresholds associated with one or more time intervals for the load to operate at in accordance with based on the power option agreement. The power option data may also specify other constraints that the load should operate in accordance with.

In some examples, the power option data may also include an indication of a monetary penalty that would be imposed upon the load for failure to operate as agreed upon for the power option agreement. In addition, the power option data may also include an indication of a monetary benefit provided to the load operating at power consumption levels that are in accordance with a power option agreement. For instance, monetary benefits could include reduced prices for power, credits for power, and/or monetary payments. In addition, the power option data may include further constraints upon power use, such as one or more maximum power thresholds and corresponding time intervals for the maximum power thresholds.

In some embodiments, the power entity **1140** may correspond to a qualified scheduling entity (QSE). A QSE may submit bids and offers on behalf of resource entities (REs) or load serving entities (LSEs), such as retail electric providers (REPs). QSEs may submit offers to sell and/or bids to buy power (energy) in the Day-Ahead Market (e.g., the next 24 hours) and the Real-Time Market. As such, the remote master control system **262** or another computing system may communicate with one or more QSEs to engage and control one or more loads in accordance with one or more power option agreements.

In some examples, a power option agreement may take the form of a fixed duration power option agreement **1144**. The fixed duration power option agreement **1144** may specify a set of minimum power thresholds and a set of time intervals in advance for an upcoming fixed duration of time covered by the agreement. Each minimum power threshold in the set of minimum power thresholds may be associated with a time interval in the set of time intervals. Examples of such association are provided in FIG. **12**. The fixed duration power option agreement may be established in advanced of the time period covered by the set of time intervals to enable the remote master control system **262** to prepare performance strategies for the load (e.g., the datacenter(s)) associated with the power option agreement. Thus, the remote master control system **262** may evaluate the fixed duration power option and other monitored conditions to determine performance strategies for a set of computing systems (e.g., one or more datacenters) during the different intervals that satisfy the minimum power thresholds.

In other examples, a power option agreement may take the form of a dynamic power option agreement **1146**. For a dynamic power option agreement **1146**, minimum power thresholds may be provided to the remote master control system **262** in real-time (or near real-time). For instance, a dynamic power option agreement may specify that the power entity **1140** may provide adjustments to minimum power thresholds and corresponding time intervals in real-time to the remote master control system **262**. For example, a dynamic power option agreement may provide power option data that specifies a minimum power threshold for immediate adjustments (e.g., for the next hour).

In an embodiment, a dynamic power option agreement **1146** may involve repeat communication between the remote master control system **262** and the power entity **1140**. Particularly, the power entity **1140** may provide signals to the remote master control system **262** that request power consumption adjustments to be initiated at one or more

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datacenters by the remote master control system **262** over short time intervals, such as across minutes or seconds. For example, the power entity **1140** may communicate to the remote master control system **262** to ramp power consumption down to a particular level within the next 5 minutes. As a result, the remote master control system **262** may provide instructions to one or more datacenters to ramp down power consumption using a linear ramp over the next 5 minutes to meet the particular level specified by the power entity **1140**. The remote master control system **262** may monitor the linear ramp down of power consumption and increase or decrease the rate that the datacenter(s) ramp down power use based on projections and updates received from the power entity **1140**. As a result, although the ramp down of power consumption may initially be performed in a linear manner to meet a power target threshold, the remote master control system **262** may adjust the rate of power consumption decrease based on updates from the power entity **1140**. For example, 25 percent of the overall power consumption ramp down may occur during a first period (e.g., 4 minutes 30 seconds) of the 5 minutes and the remaining 75 percent of the overall power consumption ramp down may occur during the remaining period of the 5 minutes (e.g., the final 30 seconds). The example percentages are included for illustration purposes and can vary within examples based on various parameters, such as additional communication (e.g., adjustments) provided by the power entity **1140**.

In further examples, a power option agreement may operate similarly to both a fixed-duration 1144 and a dynamic power option agreement **1146**. Particularly, power option data specifying minimum power thresholds and corresponding time intervals may be provided in advance for the entire fixed-duration of time (e.g., the next 24 hours). Additional power option data may then be subsequently provided enabling the remote master control system **262** to make one or more adjustments to accommodate any changes specified within the additional power option data. For instance, additional power option data may indicate that a power entity exercised its option to deliver less power to the load. As a result, the remote master control system may instruct the load to adjust power consumption based on the power entity reducing the power threshold minimum via exercising the option.

As indicated above, the remote master control system **262** may monitor conditions in addition to the constraints set forth in power option data received from the power entity **1140**. Particularly, the remote master control system **262** may monitor and analyze a set of conditions (including the power option data) to determine strategies for assigning, transferring, and otherwise managing computational operations using the one or more datacenters **1102-1106**. The determined strategies may enable efficient operation by the datacenters while also ensuring that the datacenters operate at target power consumption levels that meet or exceed the minimum power thresholds set forth within one or more power option agreements.

Example monitored conditions include, but are not limited to, power availability **1120**, power prices **1122**, computing systems parameters **1124**, cryptocurrency prices **1126**, computational operation parameters **1128**, and weather conditions **1129**. Power availability **1120** may include determining power consumption ranges at a set of computing systems and/or at one or more datacenters. In addition, power availability **1120** may also involve determining the source or sources of power available at a datacenter. For instance, the remote master control system **262** may identify the types of power sources (e.g., BTM, grid power, and/or a battery system) that a datacenter has available. Power prices **1122** may involve an analysis of the different costs associated with powering a set of computing systems. For instance, the remote master control system **262** may determine cost of power from the grid without a power option agreement relative to the cost power from the grid under the power option agreement. In addition, the remote master control system **262** may also compare the cost of grid power relative to the cost of BTM power when available at a datacenter. The power prices **1122** may also involve comparing the cost of using power at different datacenters to determine which datacenter may perform computational operations at a lower cost.

Monitoring computing system parameters **1124** may involve determining parameters related to the computing systems at one or more datacenters. For instance, the remote master control system **262** may monitor various parameters of the computing systems at a datacenter, such as the abilities and availability of various computing systems, the status of the queue used to store computational operations awaiting performance by the computing systems. The remote master control system **262** may determine types and operation modes of the computing systems, including which computing systems could operate in different modes (e.g., a higher power or a lower power mode) and/or at different hash rates and/or frequencies. The remote master control system **262** may also estimate when computing systems may complete current computational operations and/or how many computational operations are assigned to computing systems.

Monitoring cryptocurrency prices **1126** may involve monitoring the current price of one or more cryptocurrencies, the hash rate and/or estimated power consumption associated with mining each cryptocurrency, and other factors associated with the cryptocurrencies. The remote master control system **262** may use data related to monitoring cryptocurrency prices **1126** to determine whether using computing systems to mine a cryptocurrency generates more revenue than the cost of power required for performance of the mining operations.

The remote master control system **262** may monitor parameters related to computational operations (e.g., computational operation parameters **1128**). For example, the remote master control system **262** may monitor parameters related to the computational operations requiring performance and currently being performed, such quantity of operations, estimated time to complete, cost to perform each computational operation, deadlines and priorities associated with each computational operation. In addition, the remote master control system **262** may analyze computational operations to determine if a particular type of computing system may perform the computational operation better than other types of computing systems.

Monitoring weather conditions **1129** may include monitoring for any potential power generation disruption due to emergencies or other events, and changes in temperatures or weather conditions at power generators or datacenters that could affect power generation. As such, the operations and environment analysis module (or another component) of the remote master control system **262** may be configured to monitor one or more conditions described above.

The performance strategy determined by the remote master control system **262** based on the monitored conditions and/or power option data can include control instructions for the load (e.g., the datacenters and/or one or more sets of computing systems). For instance, a performance strategy can specify operating parameters, such as operating frequen-

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cies, power consumption targets, operating modes, power on/off and/or standby states, and other operation aspects for computing systems at a datacenter.

The performance strategy can also involve aspects related to the assignment, transfer, and performance of computational operations at the computing systems. For instance, the performance strategy may specify computational operations to be performed at the computing systems, an order for completing computational operations based on priorities associated with the computational operations, and an identification of which computing systems should perform which computational operations. In some instances, priorities may depend on revenue associated with completing each computational operation and deadlines for each computational operation.

The monitored conditions may enable efficient distribution and performance of computational operations among computing systems at one or more datacenters (e.g., datacenters **1102-1106**) in ways that can reduce costs and/or time to perform computational operations, take advantage of availability and abilities of computing systems at the datacenters **1102-1106**, and/or take advantage in changes in the cost for power at the datacenters **1102-1106**. In addition, the monitored conditions may also involve consideration of the power option data to ensure that the computing systems consume enough power to meet minimum power thresholds set forth in one or more power option agreements.

The various monitored conditions described above as well as other potential conditions may change dynamically and with great frequency. Thus, to enable efficient distribution and performance of the computational operations at the datacenters, the remote master control system **262** may be configured to monitor changes in the various conditions to assist with the efficient management and operations of the computing systems at each datacenter. For instance, the remote master control system **262** may engage in wired or wireless communication **1130** with datacenter control systems (e.g., datacenter control system **504**) at each datacenter as well as other sources (e.g., the power entity **1140**) to monitor for changes in the conditions.

The remote master control system **262** may analyze the different conditions in real-time to modulate operating attributes of computing systems at one or more of the datacenters. By using the monitored conditions, the remote master control system **262** may increase revenue, decrease costs, and/or increase performance of computational operations via various modifications, such as transferring computational operations between datacenters or sets of computing systems within a datacenter and adjusting performance at one or more sets of computing systems (e.g., switching to a low power mode).

In some examples, the traditional datacenter **1106** may be the load subject to a power option agreement. As such, the remote master control system **262** may factor the power option agreement when determining whether to perform computational operations using the computing systems **1112** at the traditional datacenter **1106** and/or transfer computational operations to the computing systems **1108**, **1110** at the flexible datacenters **1102**, **1104**. For instance, the monitored conditions may indicate that the price of grid power is substantially higher than BTM power. As a result, the remote master control system **262** may transfer a subset of computational operations from the traditional datacenter **1106** to the flexible datacenters **1102**, **1104**. The traditional datacenter **1106** may still have some computational operations to perform to ensure that the traditional datacenter **1106** is using enough power to meet the minimum power threshold or thresholds set forth in the power option agreement.

In some examples, the remote master control system **262** may monitor the grid frequency signal received from the power entity **1140**. When the frequency of the grid deviates a threshold amount (e.g., 0.036 Hz above or below 60 Hz), the remote master control system **262** may adjust performance strategies at the load. In some cases, the remote master control system **262** may adjust the power consumption at the load, the number of miners (or computing systems) operating at the load, and/or the frequency or hash rate, among other possible changes. The remote master control system may readjust performance strategies at the load in response to receiving additional power option data from the power entity **1140** (e.g., an indication that the frequency of the grid is back to 60 Hz). In addition, the remote master control system **262** may communicate changes in operations at the load to the power entity **1140**. This way, the power entity **1140** may obtain confirmation that the load is adjusting in accordance with a power option agreement.

In some embodiments, a power generation source (e.g., the generation station **400** shown in FIG. **4**) may enter into a power option agreement with a grid operator, which may provide the grid operator with the option to reduce the amount of power that the power source generator can deliver to the grid during a defined time interval. For instance, a wind generation farm may enter into the power option agreement with the grid operator. In addition, the remote master control system **262** may also enter into a power option agreement with the power generation source (e.g., the wind farm) to provide a load that can receive excess power from the power generation source when the grid operator exercises the option and lowers the amount of power that the power generation source can deliver to the grid. Thus, rather than reducing the amount of power produced, the power generation source could exercise an option in the agreement with remote master control system **262** and redirect excess power to one or more loads (e.g., a set of computing systems) that could ramp up power consumption in response. In such situations, the remote master control system **262** maybe able to use the excess power from the power generation source (e.g., BTM power) to perform operations at one or more loads at a low cost (or no cost at all). In addition, the power generation source may benefit from the power option agreement by directing excess power to the load instead of temporarily halting power production.

In some examples, a power option agreement may depend on parameters associated balancing grid capacity and demand. For instance, power option agreements may incentivize power consumption ramping during periods of peak grid power use.

FIG. **12** shows a graph representing power option data based on a power option agreement, according to one or more embodiments. The graph **1200** shows power option data arranged according to power **1204** over time **1202**. As shown in FIG. **12**, time **1202** increases along the X-axis and minimum power thresholds **1204** increase along the Y-axis of the graph **1200**. In the example embodiment shown in FIG. **12**, the time **1202** increases up to a full day (e.g., 24 hours) in 4 hour increments and the power is shown in MW increasing in intervals of 5 MW. The 24 duration and example minimum power thresholds can differ in other embodiments. Particularly, these values may depend on the terms set forth within the power option agreement.

The graph line **1206** represents sets of minimum power thresholds **1206**A, **1206**B, **1206**C that are specified by

power option data based on the power option agreement. As shown, the graph line **1206** extends the entire 24 hour duration, which indicates that the set of time intervals associated with minimum power thresholds add up to 24 hours. In other examples, the power option agreement may not include a minimum power threshold during a portion of the duration.

The graph line **1206** of the graph **1200** is further used to illustrate power consumption levels that one or more loads (e.g., a set of computing systems) operating according to the power option agreement may utilize during the 24 hour duration. Particularly, the power quantities above the graph line **1206** represents power levels that the load(s) may consume from the power grid during the 24 hour duration that would satisfy the requirements (i.e., the minimum power thresholds **1206**A-**1206**C) set forth by the power option agreement. In particular, the power quantities above the graph line **1206** include any power quantity that meets or exceeds the minimum power threshold at that time. By extension, the power quantities positioned below the graph line **1206** represents the amount of power that the load could be directed to reduce power consumption by per the power option agreement.

To further illustrate, an initial minimum power threshold **1206**A is shown associated with the time interval starting at hour 0 and extending to hour 8. In particular, the minimum power threshold **1206**A is set at 5 MW during this time interval. Thus, based on the power option data shown in FIG. **12**, the loads must be able to operate at a target power consumption level that is equal to or greater than the 5 MW minimum power threshold **1206**A at all times during the time interval extending from hour 0 to hour 8, in order to be able to satisfy the power option if it is exercised for that time interval. Similarly, the power entity could reduce the power consumed by loads by any amount up to 5 MW at any point during the time interval from hour 0 to hour 8 in accordance with the power option agreement. For instance, the power entity could exercise its option at any point during this time interval to reduce the power consumed by the loads by 3 MW as a way to load balance the power grid. In response to the power entity exercising its option, the load may then operate using 3 MW less power and/or another strategy determined by a control system factoring additional conditions (e.g., the price of grid power, the revenue that could be generated from mining a cryptocurrency, and/or parameters associated with computational operations awaiting performance)

As further shown in the graph **1200** illustrated in FIG. **12**, the next minimum power threshold **1206**B is associated with the following time interval, which starts at hour 8 and extends until hour 16. During this time interval (hour 8 to hour 16), the load(s) may consume 10 MW or more power since the minimum power threshold **1206**B is now set at 10 MW as shown on the Y-axis of the graph **1200**. In light of the power option data, a control system may determine and provide a performance strategy to the load (e.g., a set of computing systems) that includes a power consumption target that meets or exceeds the minimum power threshold **1206**B (i.e., 10 MW). The performance strategy may depend on the power option data as well as other possible conditions, such as the price of grid power, the availability of computing systems, and/or the type of computing operations, etc. In addition, the power entity could exercise its option to reduce the amount of power consumed by the load by 10 MW or less as represented by the power levels under the minimum threshold **1206**B that extend during the time interval of hour 8 to hour 16.

The last minimum power threshold **1206**C is associated with the time interval that starts at hour 16 and extends until hour 24. Similar to the initial minimum power threshold **1206**A associated with the beginning of the graph line **1206**, the last minimum power threshold **1206** is also set at 5 MW. As such, at any point during this interval (hour 16 to hour 24) the loads may consume 5 MW or more to operate in accordance with the power option agreement. As discussed above, by operating at 5 MW or more, the load enables the power consumed from the power grid to be reduced any amount from zero up to 5 MW during this time interval.

When determining the power consumption strategy for a load, a computing system (e.g., the remote master control system **262**) may consider various conditions in addition to the power option data received based on one or more power option agreements. Particularly, the computing system may consider and weigh different conditions in addition to the power option data to determine power consumption targets and/or other control instructions for a load. The conditions may include, but are not limited to, the price of grid power, the price of alternative power sources (e.g., BTM power, stored energy), the revenue associated with mining for one or more cryptocurrencies, parameters related to the computational operations requiring performance (e.g., priorities, deadlines, status of the queue organizing the operations, and/or revenue associated with completing each computational operation), parameters related to the set of computing systems (e.g., types and availabilities of computing systems), and other conditions (e.g., penalties if a minimum power threshold is not met and/or monetary benefits from operating under a power option agreement). By weighing various conditions, the computing system may efficiently manage the set of computing systems, including enabling performance of computational operations cost effectively and/or ensuring at that computing systems operate at target power consumption levels that one or more satisfy power option agreements.

In some examples, the computing system may decrease the amount of power that a set of computing systems consumes from one source and while also increasing the amount of power that the set consumes from another source. For instance, the computing system may determine that the price of power grid power is above a threshold price that makes computational operations relatively expensive to perform using grid power. As a result, the computing system may provide control instructions for the computing systems to consume power grid power that matches a minimum power threshold specified by power option data. This may enable the computing systems to satisfy the power option agreement while also avoiding using pricey grid power beyond the minimum amount required per the power option data. In addition, the computing system may instruct some computing systems to switch to a low power mode or temporarily stop until the price of power from the grid decreases. The computing system may instruct one or more computing systems to operate using power from another source (e.g., BTM power and/or stored energy from a battery system) and/or transfer one or more computational operations to another set of computing systems (e.g., a different datacenter).

When the power option agreement is a fixed duration power option agreement, the computing system may receive an indication of all the minimum power thresholds **1206**A-**1206**C and an indication of the associated time interval altogether and in advance of the duration associated with the power option agreement. By providing all of the minimum power thresholds **1206**A-**1206**C and the time intervals in

advance, the computing system may determine a performance strategy for the load that can extend across the entire duration. Particularly, the computing system may factor the minimum power thresholds and associated time intervals as well as other monitored conditions to determine the performance strategy for the total duration. This can enable the computing system to accept and assign computational operations to computing systems in advance while also using a performance strategy that meets the expectations of a power option agreement.

In some examples, the performance strategy determined by the computing system may include control instructions for the set of computing systems to execute if a power option is exercised. For instance, the performance strategy may specify different power consumption targets for the computing systems that depend on whether a power option is exercised during each time interval.

In some instances, the computing system may modify the performance strategy when one or more conditions change enough to warrant a modification. For instance, the computing system may receive an indication of a change in a minimum power threshold (e.g., a decrease in the minimum power threshold) and determine one or more modifications based on the new minimum power threshold and/or other conditions (e.g., a change in the price of power).

In other examples, the power option agreement may be a dynamic power option agreement. Particularly, the load may be subject to a changing minimum power threshold that can vary during a predefined duration associated with the power option agreement. For example, a dynamic power option agreement may specify that the load is subject to a minimum power threshold that may vary from 0 MW up to 5 MW during the next 24 hours and the particular minimum threshold for each hour may depend on power option data received from the power entity during the prior hour. The dynamic power option agreement may further specify the expected response time from the load. For instance, the power option agreement may indicate that an indication of a new minimum power threshold will be provided an hour prior to the start of the minimum power threshold. The computing system, for example, may receive an indication at hour 7 about the increase in the minimum power threshold **1206**B starting at hour 8. The indication may (or may not) specify the total time interval associated with a new minimum power threshold. For instance, the indication received by the computing system may specify that the 10 MW minimum power threshold **1206**B extends from hour 8 until hour 16. In other instances, the power option data may indicate that the computing system should abide by the new minimum power threshold until receiving further power option data indicating a change to another new minimum power threshold.

In some examples, the power option data may arrive at the computing system in an unknown order from the power entity with expectations of swift power consumption adjustments by the load. As a result, the power option agreement may require fast ramping of the load to meet changes. Ramping may involve ramping up or down power consumption as well as ramping operating techniques (e.g., adjusting frequency or operation mode).

In some embodiments, the type of power option power agreement may depend on the delivery and content of power option data provided to the load (or a control system controlling the load). For instance, a computing system may receive minimum power thresholds set across an entire duration associated with a power option agreement in advance when the power option agreement is a fixed-duration power option agreement. In other instances, the computing system may receive power option data dynamically and adjust operations in real-time (or near real-time). For instance, the computing system may receive a series of power option data that each specifies minimum power threshold changes during the duration set forth in the dynamic power option agreement. To illustrate an example, the computing system may receive power option data during hour 1 that specifies the minimum power threshold for hour 2, power option data during hour 2 that specifies the minimum power threshold for hour 3, and so on across the duration of the dynamic power option agreement.

In some examples, the minimum power threshold for a time interval may be zero during the duration of a power option agreement. As such, the load may use any amount of power from the power grid in accordance with the power option agreement, including no power at all during this time interval. When the price for power is high during this time frame, the load may ramp down power usage to zero MW to avoid paying the high price for power while still being in compliance with the power option agreement.

FIG. **13** illustrates a method for implementing control strategies based on a fixed-duration power option agreement, according to one or more embodiments. The method **1300** serves as an example and may include other steps within other embodiments. A control system (e.g., the remote master control system **262**) may be configured to perform one or more steps of the method **1300**. As such, the control system may take various forms of a computing system, such as a mobile computing device, a wearable computing device, a network of computing systems, etc.

At step **1302**, the method **1300** involves monitoring a set of conditions. For instance, a computing system (e.g., a control system) may monitor various conditions that could impact the performance of operations at one or more loads, including the power consumption targets at the loads. The set of monitored conditions may include a variety of information obtained from one or more external sources, such as one or more datacenters, databases, power generation stations, or types of sources.

Some example conditions include, but are not limited to, the price of grid power, the price and availability of alternative power options (e.g. BTM power, and/or stored energy), parameters of the load (e.g., ramping abilities, type of computing systems, operation modes, etc.), parameters of tasks to be performed using the power at the load (e.g., types, deadlines, priorities, and/or revenue associated with computational operations), availability of other computing systems and their associated costs, and/or revenue associated with mining a cryptocurrency. The computing system may monitor one or more of these conditions as well as others.

At step **1304**, the method **1300** involves receiving power option data based, at least in part, on a power option agreement. As discussed above, the computing system (e.g., a remote master control system) may engage in a power option agreement with a power entity. As a result, the computing system may control a load (e.g., a set of computing systems) in accordance with power thresholds and time intervals received from the power entity based on the power option agreement.

In some examples, the power option data may specify a set of minimum power thresholds and a set of time intervals. Each minimum power threshold in the set of minimum power thresholds may be associated with a time interval in the set of time intervals. To illustrate an example, the power option data may specify a first minimum power threshold

associated with a first time interval and a second minimum power threshold associated with a second time interval, with the second time interval subsequent to the first time interval.

The set of time intervals may add up to the duration represented by the power option agreement. For instance, the total duration of the set of time intervals may correspond to a twenty-four hour period (e.g., the next day). In other examples, the power option agreement may span across a different duration (e.g., 12 hours). In additional embodiments, the power option data may specify other information, such as monetary incentives associated with parameters of the power option agreement and/or one or more maximum power thresholds.

At step **1306**, the method **1300** involves determining a performance strategy for the set of computing systems based on a combination of at least a portion of the power option data and at least one condition in the set of conditions. The performance strategy may be determined responsive to receiving the power option data. In addition, the performance strategy may include a power consumption target for the set of computing systems for each time interval in the set of time intervals. In some examples, each power consumption target is equal to or greater than the minimum power threshold associated with each time interval.

As an example, the performance strategy may specify a first power consumption target for the set of computing systems for a first time interval such that the first power consumption target is equal to or greater than a first minimum power threshold associated with the first time interval and a second power consumption target for the set for a second time interval in a similar manner (i.e., the second power consumption target is equal to or greater than a second minimum power threshold).

In some examples, the performance strategy may include an sequence for the set of computing systems to follow when performing computational operations. The sequence, for example, may be based on priorities associated with the computational operations. In addition, the performance strategy may include one or more power consumption targets that are greater than the minimum power thresholds when the price of power from the power grid is below a threshold price during the time intervals associated with the minimum power thresholds.

The performance strategy may also involve transferring, delaying, or adjusting one or more computational operations performed at the set of computing systems. In addition, the performance strategy may involve adjusting operations at the computing systems. For instance, one or more computing systems may switch modes (e.g., operate at a higher frequency or switch to a low power mode).

In addition, the performance strategy may also specify power consumption targets for the set of computing systems to use if the power option is exercised during an interval. This way, the computing systems may continue to perform computational operations (or suspend performance) based on the power option being exercised.

At step **1308**, the method **1300** involves providing instructions to the set of computing systems to perform one or more computational operations based on the performance strategy. For example, the set of computing systems may operate according to the performance strategy to ensure that the minimum power thresholds are met during the defined time intervals based on the power option agreement.

Some examples may further involve receiving subsequent power option data based, at least in part, on the power option agreement. The subsequent power option data may specify to decrease one or more minimum power thresholds of the set of power thresholds. Responsive to receiving the subsequent power option data, the performance strategy for the set of computing systems may be modified based on a combination of at least a portion of the subsequent power option data and one or more conditions of the monitored conditions. The modified performance strategy may include one or more reduced power consumption targets for the set of computing systems. The amount of the reduction in a power consumption target may depend linearly with the amount that the corresponding minimum power threshold was reduced by. For instance, when a minimum power threshold for a time interval is reduced from 10 MW to 5 MW, the power consumption target for that time interval may be reduced from 10 MW to 5 MW. Instructions may be provided to the set of computing systems to perform computational operations based on the modified performance strategy.

FIG. **14** illustrates a method for implementing control strategies based on a dynamic power option agreement, according to one or more embodiments. The method **1400** serves as an example and may include other steps within other embodiments. Similar to the method **1400**, a control system (e.g., the remote master control system **262**) may be configured to perform one or more steps of the method **1400**. As such, the control system may take various forms of a computing system, such as a mobile computing device, a wearable computing device, a network of computing systems, etc.

At block **1402**, the method **1400** involves monitoring a set of conditions. Similar to block **1302** of the method **1300**, a computing system may monitor various conditions to determine instructions for controlling a set of computing systems.

At block **1404**, the method **1400** involves receiving first power option data based, at least in part, on a power option agreement while monitoring the set of conditions. The first power option data may specify a first minimum power threshold associated with a first time interval. For example, the first power option data may specify a minimum power threshold of 10 MW for the next hour, which may start in an hour or less.

The power option agreement may correspond to a dynamic power option agreement in some examples. When managing a load with respect to a dynamic power option agreement, a computing system may receive power option data specifying changes in minimum power thresholds that a load (e.g., the set of computing systems) may be designated to use in the near term (e.g., the next hour). For example, the computing system may receive power option data during each hour of the duration specified by a power option agreement that indicates a minimum power threshold for the next hour.

At block **1406**, the method **1400** involves providing first control instructions for a set of computing systems based on a combination of at least a portion of the first power option data and at least one condition. The first control instructions may be provided responsive to receiving the first power option data.

The first control instructions may include a first power consumption target for the set of computing systems for the first time interval. Particularly, the first power consumption target may be equal to or greater than the first minimum power threshold associated with the first time interval. For example, the first power consumption target may be greater than the first minimum power threshold when a cost of power from the power grid is below a threshold price during the first time interval. In other instances, the first power consumption target may be equal to the first minimum power

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threshold when the cost of power from the power grid is greater than the threshold price.

In some examples, control instructions may specify a sequence for the computing systems to follow when performing computational operations. The sequence may be based on priorities associated with each computational operation.

The first control instructions may be determined based on a combination of the first power option data, the price of power from the power grid, and parameters associated with computational operations to be performed at the set of computing systems.

In some examples, the first control instructions may involve ramping up or down power consumption at the set of computing systems. The power consumption may be ramped up or down based on the first minimum power threshold and one or more other conditions (e.g., the price of power).

At block **1408**, the method **1400** involves receiving second power option data based, at least in part, on the power option agreement while monitoring the set of conditions. The computing system may receive the second power option data subsequent to receiving the first power option data. The second power option data may specify a second minimum power threshold associated with a second time interval. For example, the second minimum power threshold may be 7 MW over the duration of the upcoming hour. In other examples, the second minimum power threshold may differ as shown in FIG. **12**.

In some instances, the computing system may receive the second power option data during the first time interval such that the second time interval overlaps the first time interval. For instance, the computing system may receive the second power option data to enable real-time adjustments to be made to the power consumed at the set of computing systems.

At block **1410**, the method **1400** involves providing second control instructions for the set of computing systems based on a combination of at least a portion of the second power option data and at least one condition. The second control instructions may be provided responsive to receiving the second power option data. The second control instructions may specify a second power consumption target for the set of computing systems for the second time interval. The second power consumption target may be equal to or greater than the second minimum power threshold associated with the second time interval.

In some examples, the computing system may provide a request to a QSE to determine the power option agreement. As such, the computing system may receive power option data (e.g., the first and second power option data) in response to providing the request to the QSE.

The computing system may monitor the price of power from the power grid, and the global mining hash rate and a price for a cryptocurrency (e.g., Bitcoin), among other conditions. The computing system may determine control instructions (e.g., the first and/or second control instructions) based on a combination of power option data, the price of power from the power grid, and the global mining hash rate and the price for the cryptocurrency. For instance, the computing system may cause one or more computing systems (e.g., a subset of computing systems) to perform mining operations for the cryptocurrency when the price of power from the power grid is equal to or less than a revenue obtained by performing the mining operations for the cryptocurrency.

Advantages of one or more embodiments of the present invention may include one or more of the following:

One or more embodiments of the present invention provides a green solution to two prominent problems: the exponential increase in power required for growing blockchain operations and the unutilized and typically wasted energy generated from renewable energy sources.

One or more embodiments of the present invention allows for the rapid deployment of mobile datacenters to local stations. The mobile datacenters may be deployed on site, near the source of power generation, and receive low cost or unutilized power behind-the-meter when it is available.

One or more embodiments of the present invention provide the use of a queue system to organize computational operations and enable efficient distribution of the computational operations across multiple datacenters.

One or more embodiments of the present invention enable datacenters to access and obtain computational operations organized by a queue system.

One or more embodiments of the present invention allows for the power delivery to the datacenter to be modulated based on conditions or an operational directive received from the local station or the grid operator.

One or more embodiments of the present invention may dynamically adjust power consumption by ramping-up, ramping-down, or adjusting the power consumption of one or more computing systems within the flexible datacenter.

One or more embodiments of the present invention may be powered by behind-the-meter power that is free from transmission and distribution costs. As such, the flexible datacenter may perform computational operations, such as distributed computing processes, with little to no energy cost.

One or more embodiments of the present invention provides a number of benefits to the hosting local station. The local station may use the flexible datacenter to adjust a load, provide a power factor correction, to offload power, or operate in a manner that invokes a production tax credit and/or generates incremental revenue.

One or more embodiments of the present invention allows for continued shunting of behind-the-meter power into a storage solution when a flexible datacenter cannot fully utilize excess generated behind-the-meter power.

One or more embodiments of the present invention allows for continued use of stored behind-the-meter power when a flexible datacenter can be operational but there is not an excess of generated behind-the-meter power.

One or more embodiments of the present invention allows for management and distribution of computational operations at computing systems across a fleet of datacenters such that the performance of the computational operations take advantages of increased efficiency and decreased costs.

It will also be recognized by the skilled worker that, in addition to improved efficiencies in controlling power delivery from intermittent generation sources, such as wind farms and solar panel arrays, to regulated power grids, the invention provides more economically efficient control and stability of such power grids in the implementation of the technical features as set forth herein.

While the present invention has been described with respect to the above-noted embodiments, those skilled in the art, having the benefit of this disclosure, will recognize that other embodiments may be devised that are within the scope of the invention as disclosed herein. Accordingly, the scope of the invention should be limited only by the appended claims.

What is claimed is:

1. A system comprising:

a set of computing systems, wherein the set of computing systems is configured to perform computational operations using power from a power grid;

a control system configured to:

monitor a set of conditions;

receive power option data based, at least in part, on a power option agreement, wherein the power option data specify: (i) a set of minimum power thresholds, and (ii) a set of time intervals, wherein each minimum power threshold in the set of minimum power thresholds is associated with a time interval in the set of time intervals;

responsive to receiving the power option data, determine a performance strategy for the set of computing systems based on a combination of at least a portion of the power option data and at least one condition in the set of conditions, wherein the performance strategy comprises a power consumption target for the set of computing systems for each time interval in the set of time intervals, wherein each power consumption target is equal to or greater than the minimum power threshold associated with each time interval; and

provide instructions to the set of computing systems to perform one or more computational operations based on the performance strategy.

2. The system of claim 1, wherein the control system is configured to monitor the set of conditions comprising:

a price of power from the power grid; and

a plurality of parameters associated with one or more computational operations to be performed at the set of computing systems.

3. The system of claim 2, wherein the control system is configured to:

determine the performance strategy for the set of computing systems based on a combination of at least the portion option data, the price of power from the power grid, and the plurality of parameters associated with the one or more computational operations.

4. The system of claim 3, wherein the performance strategy further comprises:

an order for the set of computing systems to follow when performing the one or more computational operations, wherein the order is based on respective priorities associated with the one or more computational operations.

5. The system of claim 4, wherein the performance strategy further comprises:

at least one power consumption target that is greater than a minimum power threshold when the price of power from the power grid is below a threshold price during the time interval associated with the minimum power threshold.

6. The system of claim 1, wherein the control system is further configured to:

receive subsequent power option data based, at least in part, on the power option agreement,

wherein the subsequent power option data specify to decrease one or more minimum power thresholds of the set of minimum power thresholds.

7. The system of claim 6, wherein the control system is further configured to:

responsive to receiving the subsequent power option data, modify the performance strategy for the set of computing systems based on a combination of at least the portion of the subsequent power option data and at least one condition in the set of conditions,

wherein the modified performance strategy comprises one or more reduced power consumption targets for the set of computing systems.

8. The system of claim 7, wherein the control system is further configured to:

provide instructions to the set of computing systems to perform the one or more computational operations based on the modified performance strategy.

9. The system of claim 1, wherein the control system is a remote master control system positioned remotely from the set of computing systems.

10. The system of claim 1, wherein the control system is a mobile computing device.

11. The system of claim 1, wherein the control system is configured to receive the power option data while monitoring the set of conditions.

12. The system of claim 1, wherein the control system is further configured to:

provide a request to a qualified scheduling entity (QSE) to determine the power option agreement; and

receive power option data in response to providing the request to the QSE.

13. The system of claim 1, wherein the power option data specify: (i) a first minimum power threshold associated with a first time interval in the set of time intervals, and (ii) a second minimum power threshold associated with a second time interval in the set of time intervals,

wherein the second time interval is subsequent to the first time interval.

14. The system of claim 13, wherein the control system is configured to:

determine the performance strategy for the set of computing systems such that the performance strategy comprises:

a first power consumption target for the set of computing systems for the first time interval, wherein the first power consumption target is equal to or greater than the first minimum power threshold; and

a second power consumption target for the set of computing systems for the second time interval, wherein the second power consumption target is equal to or greater than the second minimum power threshold.

15. The system of claim 1, wherein a total duration of the set of time intervals corresponds to a twenty-four hour period.

16. The system of claim 1, wherein the set of conditions monitored by the control system further comprise:

a price of power from the power grid; and

a global mining hash rate and a price for a cryptocurrency; and

wherein the control system is configured to:

determine the performance strategy for the set of computing systems based on a combination of at the portion of the power option data, the price of power from the power grid, the global mining hash rate and the price for the cryptocurrency,

wherein the performance strategy specifies for at least a subset of the set of computing systems to perform mining operations for the cryptocurrency when the price of power from the power grid is equal to or less than a revenue obtained by performing the mining operations for the cryptocurrency.

17. A method comprising:

monitoring, by a computing system, a set of conditions;

receiving, at the computing system, power option data based, at least in part, on a power option agreement, wherein the power option data specify: (i) a set of minimum power thresholds, and (ii) a set of time intervals, wherein each minimum power threshold in the set of minimum power thresholds is associated with a time interval in the set of time intervals;

responsive to receiving the power option data, determining a performance strategy for a set of computing systems based on a combination of at least a portion of the power option data and at least one condition in the set of conditions, wherein the performance strategy comprises a power consumption target for the set of computing systems for each time interval in the set of time intervals, wherein each power consumption target is equal to or greater than the minimum power threshold associated with each time interval; and

providing instructions to the set of computing systems to perform one or more computational operations based on the performance strategy.

18. The method of claim 17, wherein determining the performance strategy for the set of computing systems comprises:

identifying information about the set of computing systems; and

determining the performance strategy to further comprise instructions for at least a subset of the set of computing systems to operate at an increased frequency based on a combination of at least the portion of the power option data and the information about the set of computing systems.

19. The method of claim 17, further comprising:

receiving subsequent power option data based, at least in part, on the power option agreement, wherein the subsequent power option data specify to decrease one or more minimum power thresholds of the set of minimum power thresholds;

responsive to receiving the subsequent power option data, modifying the performance strategy for the set of computing systems based on a combination of at least the portion of the subsequent power option data and at least one condition in the set of conditions, wherein the modified performance strategy comprises one or more reduced power consumption targets for the set of computing systems; and

providing instructions to the set of computing systems to perform the one or more computational operations based on the modified performance strategy.

20. A non-transitory computer readable medium having stored therein instructions executable by one or more processors to cause a computing system to perform functions comprising:

monitoring a set of conditions;

receiving power option data based, at least in part, on a power option agreement, wherein the power option data specify: (i) a set of minimum power thresholds, and (ii) a set of time intervals, wherein each minimum power threshold in the set of minimum power thresholds is associated with a time interval in the set of time intervals;

responsive to receiving the power option data, determining a performance strategy for a set of computing systems based on a combination of at least a portion of the power option data and at least one condition in the set of conditions, wherein the performance strategy comprises a power consumption target for the set of computing systems for each time interval in the set of time intervals, wherein each power consumption target is equal to or greater than the minimum power threshold associated with each time interval; and

providing instructions to the set of computing systems to perform one or more computational operations based on the performance strategy.

* * * * *

EXHIBIT B

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Methods and Systems for Adjusting Power Consumption based on a Fixed-Duration Power Option Agreement

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number ________________________

  filed on ________________________________.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Michael T. McNamara Date (Optional) : Dec 2, 2019

Signature: ______________________

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Methods and Systems for Adjusting Power Consumption based on a Fixed-Duration Power Option Agreement

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number ______________
  filed on ______________.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Raymond E. Cline Jr. Date (Optional) : 12/3/2019

Signature: [signature]

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

EXHIBIT 2

Case 1:21-cv-00534-MN-CJB Document 7-1 Filed 06/01/21 Page 1 of 45 PageID #:

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BEARBOX LLC and AUSTIN STORMS, Plaintiffs, v. LANCIUM LLC, MICHAEL T. MCNAMARA, and RAYMOND E. CLINE, Defendants.	 C.A. No. 21-534-MN **JURY TRIAL DEMANDED** **REDACTED VERSION**

DEFENDANTS' ANSWER TO AMENDED COMPLAINT AND COUNTERCLAIMS

Defendants Lancium LLC ("Lancium"), Michael T. McNamara ("McNamara"), and Raymond E. Cline Jr. ("Cline") (collectively, "Defendants") by and through their undersigned counsel, hereby answer the Amended Complaint of Plaintiffs BearBox LLC and Austin Storms, as follows:

INTRODUCTION

1. This case is about the Defendants' theft of inventions that rightfully belong to Plaintiffs.

RESPONSE: Denied.

2. Plaintiffs developed proprietary technology relating to cryptocurrency mining systems (the "BearBox Technology"). By way of background, the BearBox Technology generally relates to an energy-efficient cryptocurrency mining system and related methods that reduce the inefficiency and environmental impact of energy-expensive mining operations by better utilizing available energy resources to increase stability of the energy grid, minimize a mining operation's impact on peak-demand, and also alleviate energy over-supply conditions. The BearBox Technology can be used to mine cryptocurrency, such as Bitcoin.

RESPONSE: Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

3. The Defendants induced the Plaintiffs to disclose the BearBox Technology to them under the guise of a possible business deal between Defendants and Plaintiffs to jointly

commercialize the BearBox Technology. Before disclosing the BearBox Technology to Defendants, Plaintiffs obtained assurances of confidentiality from Defendants.

RESPONSE: Denied.

4. The Defendants stole the BearBox Technology from Plaintiffs by converting and misappropriating it and claiming it as their own. Defendants filed a U.S. patent application that wrongfully disclosed the BearBox Technology to the U.S. Patent and Trademark Office and ultimately to the public. The claimed subject matter of the '433 Patent falls fully within the scope of the BearBox Technology. And by obtaining the '433 Patent with claims directed to the BearBox Technology, the Defendants have wrongfully obtained a patent covering the BearBox Technology and wrongfully claimed the BearBox Technology as their own.

RESPONSE: Denied.

5. Plaintiffs bring this action to correct the named inventors on the '433 Patent. The inventions claimed in the '433 Patent are inventions conceived by Storms, founder and president of BearBox.

RESPONSE: Defendants admit that Plaintiffs have brought an action to correct inventorship of the '433 patent. Defendants deny that the inventorship of the '433 patent is incorrect. Defendants deny all remaining allegations in this paragraph.

PARTIES

6. Plaintiff BearBox LLC ("BearBox") is a limited liability company organized and existing under the laws of Louisiana with its principal place of business at 4422 Highway 22, Mandeville, Louisiana 70471.

RESPONSE: Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

7. Plaintiff Austin Storms is an individual residing in Mandeville, Louisiana.

RESPONSE: Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

8. On information and belief, Defendant Lancium is a Delaware limited liability company with its principal place of business at 6006 Thomas Rd, Houston, Texas 77041. On information and belief, Lancium has a registered agent capable of accepting service in this district, Harvard Business Services, Inc. with a place of business at 16192 Coastal Highway, Lewes, DE 19958.

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RESPONSE: Admitted.

9. On information and belief, Defendant Michael T. McNamara is the Chief Executive Officer and a founder of Lancium and resides in Newport Beach, California. Defendant McNamara is named as a purported inventor on the face of the ’433 Patent.

RESPONSE: Admitted.

10. On information and belief, Defendant Raymond E. Cline, Jr. is the Chief Computing Officer of Lancium and resides in Houston, Texas. Defendant Cline is named as a purported inventor on the face of the ’433 Patent.

RESPONSE: Defendants admit that Raymond E. Clinet, Jr. is the Chief Technology officer of Lancium and resides in Houston, Texas, and is named as inventor on the fact of the ‘433 Patent. Defendants deny all remaining allegations in this paragraph.

JURISDICTION

11. This is an action seeking correction of the named inventors of a United States patent under 35 U.S.C. § 256. As such, this action arises under the laws of the United States.

RESPONSE: Defendants admit that Plaintiffs’ complaint seeks to correct inventorship under 35 U.S.C. § 256 and thus arises under the laws of the United States. Defendants deny all remaining allegations in this paragraph.

12. This Court has exclusive subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a) because the matter arises under an Act of Congress relating to patents, specifically 35 U.S.C. § 256.

RESPONSE: Defendants do not challenge the Court’s subject matter jurisdiction at this time. Defendants deny all remaining allegations in this paragraph.

13. The Court has supplemental jurisdiction under 28 U.S.C. § 1367 over all asserted claims under state law because those claims are so related to the claims in this action that arise under federal law that they form part of the same case or controversy.

RESPONSE: Defendants do not challenge the Court’s subject matter jurisdiction at this time. Defendants deny all remaining allegations in this paragraph.

14. The Court also has jurisdiction pursuant to 28 U.S.C. § 1332, as complete diversity of citizenship exists among the parties, and the amount in controversy exceeds $75,000. Plaintiff

BearBox is a citizen of the State of Louisiana because it is organized under the laws of the State of Louisiana and has its principal place of business in the State of Louisiana. Plaintiff Storms is a citizen of the State of Louisiana because he resides in the State of Louisiana. In contrast, none of the Defendants are citizens of the State of Louisiana. Defendant Lancium is a citizen of the States of Delaware and Texas because it is organized under the laws of the State of Delaware and has its principal place of business in the State of Texas. Defendant McNamara is a citizen of the State of California because he resides in the State of California. Defendant Cline is a citizen of the State of Texas because he resides in the State of Texas. Therefore, because the Plaintiffs are both citizens of the State of Louisiana (and no other states) for purposes of diversity jurisdiction, and none of the Defendants are citizens of the State of Louisiana, complete diversity exists among the parties.

RESPONSE: Defendants admit that Lancium is a citizen of the State of Delaware, that McNamara is a citizen of the State of California, and that Cline is a citizen of the State of Texas. Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

15. This Court has general personal jurisdiction over Lancium because it is organized under the laws of the State of Delaware and because it maintains an ongoing presence in this District at least through its registered agent.

RESPONSE: Lancium does not challenge this Court's personal jurisdiction over it for purposes of this matter only. Defendants deny that Lancium maintains an ongoing presence in this District. Defendants deny any remaining allegations in this paragraph.

16. This Court has specific personal jurisdiction over each of Defendants McNamara and Cline at least under Title 6 of the Delaware Code, § 18-109(a).

RESPONSE: McNamara and Cline do not challenge this Court's personal jurisdiction over them for purposes of this matter only. Defendants deny any remaining allegations in this paragraph.

17. On information and belief, Defendant McNamara is the Chief Executive Officer of Lancium. On information and belief, as the Chief Executive Offer, McNamara participates materially in the management of Lancium, has control and/or decision-making authority over Lancium, and is a key individual who takes actions on behalf of Lancium.

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RESPONSE: Defendants admit that McNamara is the CEO of Lancium and participates in the management of Lancium. To the extent understood, Defendants deny the remaining allegations in this paragraph.

18. McNamara is a necessary or proper party to this action because he has a legal interest in the dispute that is separate from the interests of Lancium and because Plaintiffs' claims against him arise out of the same facts and occurrences as the claims against Lancium. Accordingly, it serves judicial economy to consider the claims against Lancium and Defendant McNamara together. Plaintiffs' claims against Defendant McNamara arise out of his exercise of his powers as Chief Executive Officer of Lancium.

RESPONSE: This paragraph contains legal conclusions and thus no response is required. To the extent a response is required, denied.

19. On information and belief, Defendant Cline is the Chief Computing Officer of Lancium. On information and belief, as the Chief Computing Officer, Cline participates materially in the management of Lancium, has control and/or decision-making authority over Lancium, and is a key individual who takes actions on behalf of Lancium.

RESPONSE: Defendants admit that Cline is the Chief Technology Officer of Lancium and that he participates in the management of Lancium. To the extent understood, Defendants deny the remaining allegations of this paragraph.

20. Cline is a necessary or proper party to this action because he has a legal interest in the dispute that is separate from Lancium's interest and because Plaintiffs' claims against him arise out of the same facts and occurrences as the claim against Lancium. Accordingly, it serves judicial economy to consider the claims against Lancium and Defendant Cline together. Plaintiffs' claims against Defendant Cline arise out of his exercise of his powers as Chief Computing Officer of Lancium.

RESPONSE: This paragraph contains legal conclusions and thus no response is required. To the extent a response is required, denied.

21. The actions of Defendants McNamara and Cline establish sufficient minimum contacts with Delaware under Delaware law and the United States Constitution to give this Court personal jurisdiction over each of them.

RESPONSE: McNamara and Cline do not challenge this Court's personal jurisdiction over them for purposes of this matter only. Defendants deny any remaining allegations in this paragraph.

22. As described below, each Defendant has committed acts giving rise to this action.

RESPONSE: Denied.

VENUE

23. Venue is proper in this District under 28 U.S.C. § 1391(b)(3) because there is no district in which an action may otherwise be brought as provided in § 1391(b) and Defendant Lancium is subject to the Court's personal jurisdiction with respect to this action.

RESPONSE: Defendants do not contest venue for purposes of this matter only.

PLAINTIFFS' PROPRIETARY CRYPTOCURRENCY MINING TECHNOLOGY

24. As of 2018, the amount of energy required to process computer algorithms to mine cryptocurrencies like Bitcoin was three times greater than the energy required to physically mine gold. Conventional mining of "copper, gold, platinum, and rare earth oxides are 4, 5, 7, and 9 megajoules to generate one U.S. dollars," while "it costs an average of 17 megajoules to mine $1 worth of bitcoin."[1] The large amount of energy required to mine cryptocurrencies can make such mining financially prohibitive, and even when financially lucrative, the large energy requirements make cryptocurrency mining harmful to the global environment, with studies showing carbon dioxide emissions from cryptocurrency mining "single-handedly raising] global temperatures by 2 degrees by 2023." *Id*.

RESPONSE: Defendants admit that this paragraph appears to accurately but incompletely quote the website it cites to. Defendants lack knowledge sufficient to admit or deny the remaining allegations in this paragraph and therefore deny.

25. At the same time, some forms of electrical power generation are terribly inefficient. When producers of electrical power are unable to quickly adjust their operations in response to dynamically changing grid conditions, these producers frequently sell power at low or even negative prices until demand and market prices increase.

[1] https://www.marketwatch.com/story/mning-bitcoin-is-3-times-more-expensive-than-mining-gold-research-paper-finds-2018-11-06.

RESPONSE: Defendants admit that some forms of electrical power generation are less efficient than others. Defendants also admit that producers sometimes sell power at low or even negative prices, depending on grid conditions and other factors. Defendants lack knowledge sufficient to admit or deny the remaining allegations in this paragraph and therefore deny.

26. Because cryptocurrency mining is a computationally demanding process, it requires significant energy. As a result, industrial-scale cryptocurrency mining places a large energy burden on the power grid, driving demand and costs as well as increasing the likelihood of grid component failure.

RESPONSE: Defendants admit that cryptocurrency mining can require significant energy, and may under certain circumstances place an energy burden on the power grid. Defendants deny the remaining allegations in this paragraph.

27. In late 2018 and early 2019, Austin Storms sought to address these problems by developing energy-efficient cryptocurrency mining systems and methods that reduce the environmental impact of energy-intensive mining operations. Storms conceived of a system that better uses available energy resources to increase the stability of the energy grid, minimize a mining operation's impact on peak-demand, and alleviate energy over supply conditions, all while decreasing the overall energy costs of the mining operation and increasing its profitability.

RESPONSE: Defendants deny that Storms conceived of a system that better uses available energy resources to increase the stability of the energy grid, minimize a mining operation's impact on peak-demand, and alleviate energy oversupply conditions, all while decreasing the overall energy costs of the mining operation and increasing its profitability. Defendants lack knowledge sufficient to admit or deny the remaining allegations in this paragraph and therefore deny.

28. Austin Storms conceived of and developed the BearBox Technology. Storms is the president and founder of BearBox. The BearBox Technology includes hardware and software components. Structurally, the BearBox Technology includes a housing for a plurality of miners (such as ASICs, graphics cards, or the like) under the direction of a smart controller(s).

RESPONSE: Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

29. The smart controller monitors various external factors, such as current and expected energy demand and pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the system may determine whether conditions are appropriate to mine cryptocurrency and, if so, subsequently mines the cryptocurrency. Optionally, the system also includes other components for cooling, air-filtration, and related features.

RESPONSE: Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

30. In the BearBox Technology, a controller (such as a power distribution unit, network interface, or the like) monitors various external factors, such as current and expected energy demand/pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the controller(s) determines appropriate times to mine cryptocurrency in accordance with a desired performance strategy (for example, profitability thresholds). At the appropriate times, the controller initiates mining, for example, by powering on the miners.

RESPONSE: RESPONSE: Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

DEFENDANTS WRONGFULLY CLAIM THE BEARBOX TECHNOLOGY AS THEIR OWN

31. In May 2019, Storms attended the Fidelity FCAT Mining Summit in Boston, Massachusetts on behalf of BearBox to promote the BearBox Technology and seek potential customers for his revolutionary system.

RESPONSE: RESPONSE: Defendants lack knowledge sufficient to admit or deny the allegations in this paragraph and therefore deny.

32. While at the conference, Storms met Defendant McNamara. Defendant McNamara showed immediate interest in the BearBox Technology. Under the rouse of a potential business relationship, McNamara pumped Storms for details about the BearBox Technology over the course of several exchanges, which included conversations, emails, and text messages about the BearBox Technology. Storms took McNamara to dinner where McNamara continued to pump Storms for details about the BearBox Technology. At all times before and during Storms's disclosure of this information, Storms told McNamara that the BearBox Technology was confidential, and Storms relied on McNamara's good faith assurances that he would keep confidential the information he received from Storms about the BearBox Technology.

RESPONSE: Defendants admit that McNamara met Storms for the first time in May 2019 at the Fidelity FCAT Mining Summit in Boston. Defendants deny all remaining allegations in this paragraph.

33. Following the conference, McNamara continued to press Storms for additional details about the BearBox Technology via text messaging and email. Again relying on Defendant McNamara's assurances of confidentiality, Storms provided annotated system diagrams, component specifications, and modeled data sets to mimic real-world Bitcoin and energy prices. Storms included express confidentiality notices in his communications with Defendant McNamara.

RESPONSE: Defendants admit that Storms and McNamara exchanged some text messages and McNamara received a single email from Storms after the conference, and that the email from Storms contained a two-page PDF entitled BearBox Product Details Summary v1, an Excel spreadsheet containing a single set of purported modeling data with a third-party's name, two third-party "spec" sheets for commercially available air filters, and a "spec" sheet for a commercially available exhaust fan. Defendants deny all remaining allegations in this paragraph. In particular, Defendants deny that Storms included express confidentiality notices in any of his communications with McNamara.

34. After Storms disclosed the BearBox Technology to McNamara, McNamara abruptly ended all communications with Storms.

RESPONSE: Defendants admit that communications between Storms and McNamara ended. Defendants deny all remaining allegations in this paragraph.

35. Storms last communicated with McNamara on May 9, 2019 via e-mail, and after sending that message, Storms did not hear from McNamara again.

RESPONSE: Defendants admit that communications between Storms and McNamara ended. Defendants deny all remaining allegations in this paragraph.

36. At that time, Storms understood that McNamara was not interested in investing in the BearBox Technology. He had no reason to suspect that McNamara would steal the BearBox Technology and claim it as his own.

RESPONSE: Defendants deny that they stole anything or that Storms or BearBox had anything capable of being stolen. Defendants lack knowledge sufficient to admit or deny the remaining allegations in this paragraph and therefore deny.

37. On information and belief, Defendants filed U.S. provisional patent application No. 62/927,119 on October 28, 2019, naming Defendants McNamara and Cline as the purported sole joint inventors of the inventions disclosed in the application.

RESPONSE: Defendants admit that U.S. provisional patent application No. 62/927,119 was filed on October 28, 2019 and it named McNamara and Cline as inventors. Defendants deny all remaining allegations in this paragraph.

38. In addition to falsely claiming to be the inventors of the inventions disclosed in the application, Defendants wrongfully disclosed, without authorization, the confidential BearBox Technology to the United States Patent and Trademark Office.

RESPONSE: Denied.

39. Likewise, on December 4, 2019, Defendants filed U.S. Patent Application Serial No. 16/702,931, once again naming Defendants McNamara and Cline as the purported sole joint inventors of the inventions disclosed in the application.

RESPONSE: Defendants admit that U.S. Patent Application Serial No. 16/702,931 was filed on December 4, 2019 and named McNamara and Cline as inventors. Defendants deny all remaining allegations in this paragraph.

40. The ’433 Patent issued on March 31, 2020 naming Defendants McNamara and Cline as the sole purported inventors on the face of the patent. A true and correct copy of the ’433 Patent is attached hereto as Exhibit A.

RESPONSE: Defendants admit that the ‘433 patent issued on or about March 31, 2020 and names McNamara and Cline as inventors. Defendants also admit that a copy of the ‘433 patent appears to be attached to the complaint as Exhibit A. Defendants deny all remaining allegations in this paragraph.

41. The inventions claimed in the ’433 patent fall within the scope of the BearBox Technology, yet Defendants falsely identified themselves as the inventors of the claimed inventions, when, in fact, Storms is the sole inventor of the claimed inventions.

RESPONSE: Denied.

42. On information and belief, McNamara and Cline assigned their purported rights in the ’433 patent to Lancium. On information and belief, at all times, Lancium was aware that

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McNamara and Cline, both officers of Lancium, were not the rightful inventors of the BearBox Technology disclosed in the patent and the inventions claimed in the patent.

RESPONSE: Defendants admit that McNamara and Cline assigned their rights in the '433 patent to Lancium. Defendants deny all remaining allegations in this paragraph.

43. Defendants McNamara and Cline each submitted signed declarations falsely swearing that they were "an original joint inventor" of the claimed subject matter . A true and correct copy of Defendant McNamara's and Defendant Cline's declarations are attached as Exhibit B.

RESPONSE: Defendants admit that Exhibit B appears to be a copy of declarations by McNamara and Cline. Defendants deny all remaining allegations in this paragraph.

44. On August 14, 2020, Lancium filed a lawsuit in the U.S. District Court for the Western District of Texas against Layerl Technologies, Inc. ("Layerl") asserting that Layerl infringes the '433 patent. That case is captioned *Lancium LLC v. Layerl Technologies, Inc.*, Case No. 6:20-cv-739 (W.D. Texas) (the "Layerl Lawsuit").

RESPONSE: Defendants admit that they filed the Layer1 Lawsuit against Layer1 Technologies, Inc. on August 12, 2020. The complaint in that matter speaks for itself.

Defendants deny any remaining allegations in this paragraph.

45. As part of the Layerl Lawsuit, Defendants falsely asserted that McNamara and Cline are the sole inventors of the inventions claimed in the '433 patent.

RESPONSE: Defendants admit that they have asserted, and continue to assert, that McNamara and Cline are the sole and properly named inventors of the '433 patent. Defendants deny all remaining allegations of this paragraph.

46. Plaintiffs became aware of Defendants' wrongful use of the BearBox Technology on or about August 17, 2020, when they learned about the Layerl Lawsuit through a press release dated August 14, 2020, posted by Lancium on PRNewswire. That press release is available at the following URL: https://www.prnewswire.com/news-releases/controllable-load- resource-clr-market-leader-lancium-files-patent-infringement-lawsuit-against-layerl- 301112687.html.

RESPONSE: Defendants admit that a press release dated August 14, 2020 was posted on PRNewswire. Defendants lack knowledge sufficient to admit or deny the remaining allegations in this paragraph and therefore deny.

47. Before seeing the August 14, 2020 press release, Plaintiffs were unaware of Defendants' wrongful use of the BearBox Technology and was unaware of the '433 patent.

RESPONSE: Defendants deny that they have used any technology of BearBox or Storms. Defendants lack knowledge sufficient to admit or deny the remaining allegations in this paragraph and therefore deny.

48. On March 5, 2021, Lancium and Layerl entered a Stipulation to Dismiss with Prejudice in the Layerl Lawsuit. According to the stipulation, the parties had entered a Settlement Agreement to resolve the Layerl Lawsuit.

RESPONSE: Defendants admit that Lancium and Layer1 entered into a settlement agreement and, around March 5, 2021, a stipulation to dismiss the Layer1 Lawsuit. The stipulation speaks for itself. Defendants deny any remaining allegations in this paragraph.

49. According to a press release issued by Lancium on March 8, 2021, Lancium and Layer 1 "have entered into a mutually beneficial partnership. Layer 1 has licensed Lancium's intellectual property and Lancium will provide Smart Response™ software and services to Layerl." The press release is available at the following URL: https://www.prnewswire.com/ news-releases/1 ancium-and4ayerl-settle-patent-infringement-suit-301242602.html

RESPONSE: The press release speaks for itself. This paragraph appears to accurately quote from the press release. Defendants deny any remaining allegations in this paragraph.

50. On information and belief, as part of the Settlement Agreement between Lancium and Layerl to settle the Layerl Lawsuit, Lancium received and continues to receive valuable consideration from Layerl, all of which rightly belongs to Plaintiffs, the rightful owners of the inventions claimed in the '433 Patent.

RESPONSE: Defendants deny that Plaintiffs are the rightful owners of the inventions claimed in the '433 Patent and deny that any consideration related to the '433 Patent rightly belongs to Plaintiffs. The terms of Lancium's settlement agreement with Layer1 are confidential. Defendants deny any remaining allegations in this paragraph.

COUNT I
CORRECTION OF INVENTORSHIP FOR THE '433 PATENT:
AUSTIN STORMS AS SOLE INVENTOR

51. Plaintiffs incorporate the above paragraphs by reference.

RESPONSE: Defendants incorporate by reference all of their answers above.

52. Storms is the sole inventor of the subject matter claimed in the ’433 Patent.

RESPONSE: Denied.

53. Through omission, inadvertence, and/or error, Storms was not listed as an inventor on the ’433 patent and the currently listed inventors on the ’433 patent were improperly listed. The omission, inadvertence, and/or error occurred without any deceptive intent on the part of Storms or BearBox.

RESPONSE: Denied.

54. Unless Defendants Lancium, McNamara, and Cline are enjoined from asserting that McNamara and Cline are the sole inventors of the ’433 Patent in violation of U.S. federal patent laws, Plaintiffs will suffer irreparable injury. Plaintiffs have no adequate remedy at law.

RESPONSE: Denied.

COUNT II
IN THE ALTERNATIVE, CORRECTION OF INVENTORSHIP FOR THE ’433 PATENT: AUSTIN STORMS AS JOINT INVENTOR WITH THE CURRENTLY NAMED INVENTORS

55. Plaintiffs incorporates the above paragraphs by reference.

RESPONSE: Defendants incorporate by reference all of their answers above.

56. In the alternative, Storms is a joint inventor of the subject matter claimed in the ’433 Patent and should be added to the individuals currently named as inventors on the ’433 Patent.

RESPONSE: Denied.

57. Through omission, inadvertence, and/or error, Storms was not listed as an inventor on the ’433 patent and the currently listed inventors on the ’433 patent were improperly listed. The omission, inadvertence, and/or error occurred without any deceptive intent on the part of Storms.

RESPONSE: Denied.

58. Unless Defendants Lancium, McNamara, and Cline are enjoined from asserting that McNamara and Cline are the sole inventors of the ’433 Patent in violation of U.S. federal patent laws, Plaintiffs will suffer irreparable injury. Plaintiffs have no adequate remedy at law.

RESPONSE: Denied.

COUNT III
CONVERSION BY LANCIUM, MCNAMARA, AND CLINE

59. Plaintiffs incorporates the above paragraphs by reference.

RESPONSE: Defendants incorporate by reference all of their answers above.

60. Austin Storms, in his capacity as founder and President of BearBox, conceived, developed, and reduced to practice the BearBox Technology. Plaintiffs own the BearBox Technology, related know-how, and related intellectual property. Plaintiffs owned this property during all relevant time periods in this suit. Information on the BearBox Technology was provided to Defendants solely for the purposes of evaluation for a potential business relationship and under strict confidentiality obligations.

RESPONSE: Defendants deny that Storms conceived what he now refers to as the "BearBox Technology." Defendants deny all remaining allegations in this paragraph.

61. Defendants assumed dominion and control over the BearBox Technology by claiming it as their own in the '433 patent. Through their wrongful conduct in obtaining the '433 Patent and claiming the BearBox Technology as their own, the Defendants have wrongfully obtained the purported ability to exclude Plaintiffs and others from using the BearBox Technology. This constitutes unauthorized and unlawful conversion by Defendants.

RESPONSE: Denied.

62. As a result of Defendants' wrongful actions, Plaintiffs will suffer imminent and irreparable damages in an amount to be proven at trial. In particular, Plaintiffs have been damaged by losing valuable intellectual property from which Plaintiffs would have derived substantial revenue via licensing and/or selling patented products.

RESPONSE: Denied.

COUNT IV
UNJUST ENRICHMENT BY LANCIUM, MCNAMARA, AND CLINE

63. Plaintiffs incorporate the above paragraphs by reference.

RESPONSE: Defendants incorporate by reference all of their answers above.

64. Plaintiffs conferred a benefit on Defendants by providing them valuable intellectual property about cryptocurrency mining systems and related confidential information and materials under the boundaries of a potential collaboration between BearBox and Lancium.

RESPONSE: Denied.

65. Defendants accepted that cryptocurrency mining intellectual property and, indeed, continuously asked Storms to provide more information and materials, having recognized the benefit that Defendants received by having access to the BearBox Technology.

RESPONSE: Denied.

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66. Defendants accepted and retained the BearBox Technology, and used it to their own advantage, at Plaintiffs' expense.

RESPONSE: Denied.

67. Defendants have been and continue to be unjustly enriched by profiting from their wrongful conduct. In particular, Defendants have unlawfully used Plaintiffs' property by asserting inventorship over the BearBox Technology, and deriving an unjust benefit from exploiting Storms's cryptocurrency mining inventions. It would be inequitable for Defendants to retain these benefits under these circumstances.

RESPONSE: Denied.

68. Plaintiffs have incurred, and continue to incur, detriment in the form of loss of money and property as a result of Defendants' wrongful use of Plaintiffs' intellectual property, including the right to any patent based on their own intellectual property. The intellectual property, including the right to any patents based on Plaintiffs' intellectual property and to any patent documents (including assignment documents), U.S. and foreign, are unique and there is no adequate remedy at law.

RESPONSE: Denied.

69. The harm to Plaintiffs is continuous, substantial, and irreparable.

RESPONSE: Denied.

COUNT V
NEGLIGENT MISREPRESENTATION BY LANCIUM AND MCNAMARA

70. Plaintiffs incorporate the above paragraphs by reference.

RESPONSE: Defendants incorporate by reference all of their answers above.

71. In connection with the potential work involving cryptocurrency mining systems and related methods, Storms told Defendant McNamara that the cryptocurrency mining systems and related methods were proprietary to Plaintiffs and not to be used or shared outside of Lancium. Defendant McNamara gave his word that he would abide by this confidentiality. On information and belief, Defendant McNamara agreed to keep the BearBox Technology confidential despite later recklessly incorporating the BearBox Technology into his own patent applications and swearing, as recently as December 4, 2019, that he is an inventor of the BearBox Technology. Storms relied on Defendant McNamara's assurances of confidentiality and continued to share details about the BearBox Technology with Defendants.

RESPONSE: Denied.

72. If Plaintiffs had known that Defendants would secretly incorporate the BearBox Technology into Defendants' own patent applications to claim them as Defendants' intellectual

property, Plaintiffs would not have continued working with and sharing intellectual property with Defendants.

RESPONSE: Denied.

73. Plaintiffs suffered a pecuniary loss based on this reliance including the loss of potential patent rights, and the costs of Plaintiffs' know-how converted under the guise of a potential business relationship.

RESPONSE: Denied.

AFFIRMATIVE DEFENSES

First Affirmative Defense
(Failure to State a Claim - Counts I and II)

Plaintiffs' Counts I and II fail to state a claim to correct inventorship of the '433 patent with Austin Storms as the sole inventor (Count I) or Austin Storms as a joint inventor (Count II), at least because:

A. The alleged BearBox Technology was not conceived of or reduced to practice by Storms, as evidenced by at least PCT Application No. PCT/US2018/017950, which was filed February 3, 2018, and which published July 18, 2019 as WO2019139632A1, and which predates any alleged conception or development by Storms;

B. Storms did not contribute to the subject matter claimed by the '433 patent, either through conception or reduction to practice; and

C. Plaintiffs' cannot satisfy one or more requirements of 35 U.S.C. § 256, including omission, inadvertence, and/or error for which Storms was not listed as an inventor of the '433 patent.

Second Affirmative Defense
(Failure to State a Claim - Count III)

Plaintiffs' Count III fails to state a claim for conversion by Lancium, McNamara, or Cline, at least because:

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A. Plaintiffs cannot establish legal ownership over any property that was allegedly acquired, transferred, removed, altered, or destroyed by Defendants in an unauthorized manner; and

B. Plaintiffs cannot identify any property over which Plaintiffs had legal ownership that Defendants have improperly used or asserted improper ownership.

Third Affirmative Defense
(Failure to State a Claim – Count IV)

Plaintiffs' Count IV fails to state a claim for unjust enrichment by Lancium, McNamara, orCline, at least because:

A. Plaintiffs have pled other available remedies at law and/or cannot establish no other remedy available at law, and thus, as a matter of law are precluded from asserting an unjust enrichment claim; and

B. There is no absence of justification or cause for the alleged enrichment and/or alleged impoverishment.

Fourth Affirmative Defense
(Failure to State a Claim – Count V)

Plaintiffs' Count V fails to state a claim for negligent misrepresentation by Lancium and McNamara, at least because:

A. Defendants had no legal duty to Plaintiffs;

B. Defendants did not breach any legal duty owed to Plaintiffs; and

C. None of Defendants' actions can be said to be the legal cause of Plaintiffs' alleged injury.

Fifth Affirmative Defense
(No Merger of Intangible Rights)

Plaintiffs did not transfer intangible rights to Defendants that can be said to have been

merged into any tangible property, and which satisfy the requirements of conversion.

Sixth Affirmative Defense
(Consent or Approval)

Any alleged exchange or transfer of property between the parties was performed with Plaintiffs'full consent and/or approval and, thus precludes Plaintiffs' claim for conversion.

Seventh Affirmative Defense
(Equitable Defenses)

Plaintiffs' Counts I through V are barred, in whole or in part, by laches, equitable estoppel,estoppel, implied license, waiver, ratification, acquiescence, unclean hands, and/or other related equitable doctrines.

Eighth Affirmative Defense
(Unavailability of Injunctive Relief)

Plaintiffs are not entitled to injunctive relief because any injury to them is not immediate and irreparable, they would have an adequate remedy at law, the balance of hardships favors no injunction, and the public interest is best served by no injunction.

Ninth Affirmative Defense
(Failure to Mitigate Damages)

To the extent any damages to Plaintiffs exist, Plaintiffs have failed to mitigate such damages, as required by law.

Tenth Affirmative Defense
(No Exemplary or Punitive Damages)

Plaintiffs are precluded from recovering exemplary or punitive damages that are inconsistent with Defendants' rights of due process and equal protection under the Fifth and Fourteenth Amendments to the U.S. Constitution, and under the Delaware Constitution. No alleged

act or omission of Defendants was done willfully or maliciously with regard to any right of Plaintiffs; therefore, any claim for exemplary damages is barred. Further, no punitive or exemplary damages may be awarded in this case because there was no outrageous or malicious conduct nor any willful and wanton misappropriation.

Eleventh Affirmative Defense
(No Attorneys' Fees, Enhanced or Other Damages)

Plaintiffs' claim that this case is exceptional and that an award of attorneys' fees pursuant to 35 U.S.C. § 285 is justified has no basis in fact or law and should be denied. Likewise, Plaintiffs claims for costs, consequential damages, disgorgement of any ill-gotten gains, unjust enrichment, restitution, reasonable royalty damages, lost profits damages, reliance damages, interest, and attorneys' fees against Defendants have no basis in fact or law and thus should be denied.

Twelfth Affirmative Defense
(Additional Defenses)

The Defendants reserve all affirmative defenses under Rule 8(c) of the Federal Rules of Civil Procedure and any other defenses, at law or in equity, that may now exist or in the future be available based on discovery and further factual investigation in this case.

COUNTERCLAIMS

Counter-Plaintiff Lancium LLC ("Lancium"), for its Counterclaims against Counter-Defendants BearBox LLC ("BearBox") and Austin Storms ("Storms"), hereby alleges as follow:

INTRODUCTION

1. Lancium is a leading innovator in the field of flexible datacenters to perform blockchain hashing operations with little to no energy costs using clean and renewable energy that would otherwise be wasted.

2. Storms and BearBox's claims in their Complaint against Lancium and its founders are nothing more than an attempt to extort money from, and tarnish the reputation of, Lancium, a market leader.

3. The Complaint alleges that Storms developed the "BearBox Technology" in "[i]n late 2018 and early 2019." Complaint ¶ 27.

4. According to the Complaint, "[i]n the BearBox Technology, a controller (such as a power distribution unit, network interface, or the like) monitors various external factors, such as current and expected energy demand/pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the controller(s) determines appropriate times to mine cryptocurrency in accordance with a desired performance strategy (for example, profitability thresholds). At the appropriate times, the controller initiates mining, for example, by powering on the miners." Complaint ¶ 30.

5. The Complaint goes on to describe the "BearBox Technology" as including "hardware and software components. Structurally, the BearBox Technology includes a housing for a plurality of miners (such as ASICs, graphics cards, or the like) under the direction of a smart controller(s)." Complaint ¶ 28. And "[t]he smart controller monitors various external factors, such as current and expected energy demand and pricing information, current and expected

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cryptocurrency pricing, and the like. Based on these external factors, the system may determine whether conditions are appropriate to mine cryptocurrency and, if so, subsequently mines the cryptocurrency." Complaint ¶ 29.

6. The Complaint alleges that Storms disclosed the "BearBox Technology" to Lancium representatives in May 2019, and that Lancium stole the technology, claimed it as its own, and received a patent on the "BearBox Technology," U.S. Patent No. 10,608,433 (the '433 Patent).

7. The fatal flaw in Storms's story is that all of the "BearBox Technology" was old news to Lancium, a leading innovator in this space.

8. Storms fails to appreciate what was abundantly clear when Storms first approached Michael McNamara: the so-called "BearBox Technology" was far behind Lancium's documented development efforts.

9. In fact, Lancium years ago developed all of the technology that Storms claims makes up the "BearBox Technology," as evidenced at least by Lancium's published patent application, WO 2019/139632 A1 (attached as Exhibit A) (the '632 application).

10. The '632 application was filed on February 13, 2018 based on work that began even earlier—long before Storms claims to have developed the BearBox Technology, and over 15 months before Storms ever spoke to anyone from Lancium.

11. The inventions in the '433 patent (attached as Exhibit B) are much more advanced than the so-called "BearBox Technology."

12. Because Lancium's Michael T. McNamara and Raymond E. Cline, Jr. are the true and correct inventors of the invention claimed in the '433 patent, all of Storms's claims fail and

the Court should declare McNamara and Cline the sole inventors of the ‘433 patent and Lancium the sole assignee of the ‘433 patent.

PARTIES

13. On information and belief, BearBox is a limited liability company organized and existing under the laws of Louisiana with its principal place of business at 4422 Highway 22, Mandeville, Louisiana 70471.

14. On information and belief, Storms is an individual residing in Mandeville, Louisiana.

15. Lancium is the leader in truly carbon-neutral computing and using computing to solve over-generation problems caused by the growth of renewable energy. Lancium is a Delaware limited liability company with its principal place of business at 6006 Thomas Rd, Houston, Texas 77041.

JURISDICTION

16. The Court has subject matter jurisdiction over these Counterclaims pursuant to 28 U.S.C. §§ 1331, 1338(a), 2201, and 2202.

17. Having filed suit in this Court, BearBox and Storms have consented to personal jurisdiction in this Court and availed themselves of the privileges and benefits of this Court.

18. Venue is proper in this judicial district pursuant to 28 U.S.C. § 1391(b) as BearBox and Storms are subject to personal jurisdiction in this District, based, among other things, on their actions in affirmatively seeking the benefit of this Court in filing this civil action.

19. As BearBox and Storms have alleged in their Complaint, there is an actual and justiciable case or controversy before this Court as to the inventorship of the ‘433 Patent.

LANCIUM IS THE TRUE INNOVATOR IN THIS FIELD

20. Lancium is a technology company creating software and intellectual property solutions that enable more renewable energy on the nation's power grid. Lancium's products include Lancium Smart Response™ for rapid server power management, and Lancium Compute™, a platform for high throughput computing applications. Lancium's solutions help ensure that renewable energy can power our future.

21. Lancium is the leader in data center power ramping software.

22. As data center power demand continues to escalate, Lancium Smart Response™ software can unlock huge power costs savings for data center owners. The software also provides critical services to the power grid ensuring reliability and resiliency. As every grid takes on more renewable energy, the power market will need much greater quantities of flexible load, and in particular, Controllable Loads enabled by Lancium Smart Response™. Lancium Smart Response™ functionality enables data centers to provide this crucial service.

23. Lancium has numerous issued and pending patents.

24. Lancium's issued patents include the following:

- U.S. Patent No. 10,873,211 (filed Sept. 13. 2018) "Systems and Methods for Dynamic Power Routing with Behind-the-Meter Energy Storage"
- U.S. Patent No. 10,444,818 (filed Oct. 30, 2018) "Methods and Systems for Distributed Power Control of Flexible Datacenters"
- U.S. Patent No. 10,367,353 (filed Oct. 30, 2018) "Managing Queue Distribution between Critical Datacenter and Flexible Datacenter"
- U.S. Patent No. 10,452,127 (filed Jan. 11, 2019) "Redundant Flexible Datacenter Workload Scheduling"
- U.S. Patent No. 10,618,427 (filed Oct. 8, 2019) "Behind-the-Meter Branch Loads for Electrical Vehicle Charging
- U.S. Patent No. 10,608,433 (filed Dec. 4, 2019) "Methods and Systems for Adjusting Power Consumption Based on a Fixed-Duration Power Option

Agreement"

- U.S. Patent No. 10,857,899 (filed Mar. 4, 2020) "Behind-the-Meter Branch Loads for Electrical Vehicle Charging"

25. One of Lancium's patent applications, International Application Number PCT/US2018/0 17950, was filed on February 13, 2018 and published as the '632 application on July 18, 2019.

26. The '632 application describes a method and system for dynamic power delivery to a flexible datacenter using unutilized energy sources. In one embodiment of the invention:

> a method and system for dynamic power delivery' to a flexible datacenter uses unutilized behind-the-meter power sources without transmission and distribution costs. The flexible datacenter may be configured to modulate power delivery to one or more computing systems based on the availability of unutilized behind-the-meter power or an operational directive. For example, the flexible datacenter may ramp-up to a fully online status, ramp-down to a fully offline status, or dynamically reduce power consumption, act a load balancer, or adjust the power factor. Advantageously, the flexible datacenter may perform computational operations, such as blockchain hashing operations, with little to no energy costs, using clean and renewable energy that would otherwise be wasted.

See '632 application ¶ [0022].

27. Put simply, and as discussed more thoroughly below, the '632 application describes the so-called "BearBox technology."

28. The '632 application claims priority to U.S. Provisional Application No. 62/616,348 (the "'348 Provisional"), filed on Jan. 11, 2018.

29. The '632 application lists the following Lancium current or former personnel as inventors: David Henson, Michael McNamara, and Raymond Cline.

30. The '632 application lists the "Applicant" as Lancium LLC.

31. On information and belief, BearBox LLC knew of the '632 application before filing the Complaint in this action.

32. On information and belief, Austin Storms knew of the '632 application before filing the Complaint in this action.

33. The '632 application was filed before Storms admits he developed the alleged "BearBox Technology."

34. The '632 application and '348 Provisional were each filed well before "late 2018 and early 2019," when BearBox and Storms aver that Storms first conceived of the so-called "BearBox Technology."

35. The '632 application and '348 Provisional were each filed over a year before "May 2019," when BearBox and Storms aver that Storms met and allegedly "disclosed" the so-called "BearBox Technology" to McNamara. Complaint ¶¶ 31-34.

36. The '632 application is only one example of the Lancium's innovations and the intellectual property covering those innovations.

AUSTIN STORMS PROVIDED NOTHING OF VALUE TO LANCIUM

37. In May 2019, Lancium representatives, including McNamara, attended the Fidelity Center for Advanced Technology Bitcoin Mining Conference in Boston, MA ("Conference").

38. McNamara and Austin Storms first met the evening of May 3, 2019 at a cocktail reception for the Conference.

39. McNamara was mingling with a group of third-party individuals in the Bitcoin mining field and suggested they all go to dinner. Storms was in that group.

40. Dinner attendees in the group included competitors in the Bitcoin mining field.

41. At the dinner, there were approximately eight people in attendance at McNamara's table. The dinner attendees engaged in friendly table discussions regarding their various businesses.

42. Storms sat across the table from McNamara and promoted his Bitcoin mining containers.

43. Conversations between Storms and McNamara occurred in front of the other attendees, which included Bitcoin mining competitors.

44. At no point did Storms state or suggest that anything he told or shared with McNamara and the dinner attendees was confidential.

45. At no point did McNamara tell Storms that he would keep the conversations, or any purported information exchanged between them, confidential.

46. Storms and McNamara exchanged a series of text messages between May 3 and May 9, 2019.

47. A true and correct copy of the text messages between Storms and McNamara is attached as Exhibit C.

48. The texts do not indicate that any information shared between the parties is confidential or should be kept confidential.

49. Storms sent McNamara a single email. The email is dated May 9, 2019.

50. A true and correct copy of the email from Storms to McNamara, with attachments, is attached as Exhibit D.

51. The email from Storms does not state that any of the information being provided was confidential or a trade secret.

52. One of the email attachments provided by Storms to McNamara was a purported modeled data set for a third-party wind farm operator.

53. On information and belief, most of the information in the modeled data set was provided to Storms by the third-party wind farm operator.

54. On information and belief, the "modeled" aspect of the data from Storms were trivial math calculations in cell columns.

55. At least as early as November 2018, Lancium had provided advanced modeling data to the same third-party wind farm operator, for the same wind farm site, using the same data received from the wind farm operator that was also provided by the wind farm operator to Storms.

56. After review of the limited material sent by Storms, Lancium decided that its in-house containers were more cost-effective than those Storms was trying to sell and thus did not communicate further with Storms.

57. The materials provided to McNamara by Storms were never used by Lancium.

58. None of Lancium's intellectual property, products, or services were derived from or developed from any of the materials sent by Storms to McNamara.

THE BEARBOX TECHNOLOGY WAS OLD NEWS TO LANCIUM

59. The Complaint recites that Storms conceived and developed the alleged "BearBox Technology." The Complaint does not describe or allege any further subject matter which Storms allegedly might have conceived or developed.

60. The alleged BearBox Technology is defined at Complaint ¶¶ 2, 28

61. The chart below proves that the "BearBox Technology" alleged in Storms and BearBox's complaint was previously conceived by Lancium and described in Lancium's WO'632 application.

	Alleged BearBox Technology	**Lancium's WO'632 Application**
	BearBox Technology Definition. Complaint at ¶2.	
1	an energy-efficient cryptocurrency mining system and related methods	Method and system for dynamic power delivery to a flexible datacenter using unutilized energy sources. **WO'632 Title.**

		One of ordinary skill in the art will recognize that computing system 100 may be a conventional computing system or an application-specific computing system. In certain embodiments, an application-specific computing system may include one or more ASICs (not shown) that are configured to perform one or more functions, such as hashing, in a more efficient manner. **WO'632 at [0027].**
2	that reduce the inefficiency and environmental impact of energy-expensive mining operations	The intensive computational demand of blockchain applications makes the widespread adoption of blockchain technology inefficient and unsustainable from an energy and environmental perspective. WO'632 at [0020]. … the issue remains, the widespread adoption of blockchain technology will require substantially more power than is economically and environmentally feasible. **WO'632 at [0021**]. Advantageously, the flexible datacenter may perform computational operations, such as blockchain hashing operations, with little to no energy costs, using clean and renewable energy that would otherwise be wasted. **WO'632 at [0022].**
3	by better utilizing available energy resources to increase stability of the energy grid, minimize a mining operation's impact on peak-demand, and also alleviate electricity undersupply and/or oversupply conditions.	Datacenter control system 220 may monitor unutilized behind-the-meter power availability at the local station (not independently illustrated) and determine when a datacenter ramp-up condition is met. Unutilized behind-the-meter power availability may include one or more of excess local power generation, excess local power generation that the grid cannot accept, local power generation that is subject to economic curtailment, local power generation that is subject to reliability curtailment, local power generation that is subject to power factor correction, situations where local power generation is prohibitively low, start up situations, transient situations, or testing situations where there is an economic advantage to using locally generated behind-the-meter power generation, specifically power available at little to no cost and with no associated transmission or distribution costs. **WO'632 at [0041].**

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		Another example of unutilized behind-the-meter power availability is when wind farm 600 is producing power to grid 660 that is unstable, out of phase, or at the wrong frequency, or grid 660 is already unstable, out of phase, or at the wrong frequency for whatever reason. **WO'632 at [0055].** Another example of unutilized behind-the-meter power availability is when wind farm 600 is selling power to grid 660 at a negative price because grid 660 is oversupplied or is instructed to stand down and stop producing altogether. **WO'632 at [0054].**

62. The '632 application discloses energy-efficient cryptocurrency mining systems and related methods. See, e.g., '632 Application, Title; '632 application at [0027]; '632 application claims 1-34.

63. The '632 application discloses mining systems and methods for reducing the inefficiency and environmental impact of energy-expensive mining operations. See, e.g., '632 application at [0020], [0021], [0022].

64. The '632 application discloses improved mining systems and methods for better utilization of available energy resources to increase stability of the energy grid, minimize a mining operation's impact on peak-demand, and also alleviate electricity undersupply and/or oversupply conditions. See, e.g., '632 application at [0041], [0054], [0055].

65. Consequently, the '632 Application discloses each aspect of the alleged "BearBox Technology."

66. The Complaint further describes technology allegedly created by Storms at Complaint ¶¶ 27-30. This technology was previously conceived by Lancium and described in the WO'632 application, as shown in the table below.

	Alleged Cryptocurrency Mining Technology	Lancium's WO'632 Application
	Alleged BearBox Mining Technology. Complaint at ¶¶27-30.	
4	In late 2018 and early 2019, Austin Storms sought to address these problems by developing energy-efficient cryptocurrency mining systems and methods that reduce the environmental impact of energy-intensive mining operations. Storms conceived of a system that better uses available energy resources to increase the stability of the energy grid, minimize a mining operation's impact on peak-demand, and alleviate electricity undersupply and/or oversupply conditions, all while decreasing the overall energy costs of the mining operation and increasing its profitability. **Complaint at ¶27.**	See #1-#3 above. As such, the flexible datacenter may perform computational operations, such as hashing function operations, with little to no energy cost. **WO'632 at [0077].**
5	The BearBox Technology includes hardware and software components. Structurally, the BearBox Technology includes a housing for a plurality of miners (such as ASICs, graphics cards, or the like) under the direction of a smart controller(s). **Complaint at ¶28.**	A flexible datacenter includes a mobile container, a behind-the-meter power input system, a power distribution system, a datacenter control system, a plurality of computing systems, and a climate control system. The datacenter control system modulates power delivery to the plurality of computing systems based on unutilized behind-the-meter power availability or an operational directive. **WO'632 at Abstract.** Computing system 100 may include one or more central processing units (singular "CPU" or plural "CPUs") 105, host bridge 110, input/output ("IO") bridge 115, graphics processing units (singular "GPU" or plural "GPUs") 125, and/or application-specific integrated circuits (singular"ASIC or plural"ASICs") (not shown) disposed on one or more printed circuit boards (not shown) that are configured to perform computational operations. **WO'632 at [0023].**

		CPU 105 may be a general purpose computational device typically configured to execute software instructions. **WO'632 at [0024].**
6	The smart controller monitors various external factors, such as current and expected energy demand and pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the system may determine whether conditions are appropriate to mine cryptocurrency and, if so, subsequently mines the cryptocurrency. **Complaint at ¶30.**	Datacenter control system 220 may be a computing system (e.g., 100 of Figure 1) configured to dynamically modulate power delivery to one or more computing systems 100 disposed within flexible datacenter 200 based on unutilized behind-the-meter power availability or an operational directive from a local station control system (not shown), a remote master control system (not shown), or a grid operator (not shown). **WO'632 at [0030].** Datacenter control system 220 may independently, or cooperatively with one or more of local station control system 410, remote master control system 420, and grid operator 440, modulate power delivery to flexible datacenter 200. Specifically, power delivery' may be dynamically adjusted based on conditions or operational directives. **WO'632 at [0039].** Remote master control system 420 may be a computing system (e.g., 100 of Figure 1) that is located offsite, but connected via a network connection 425 to datacenter control system 220, that is configured to provide supervisory or override control of flexible datacenter 200 or a fleet (not shown) of flexible datacenters 200. **WO'632 at [0040].** Datacenter control system 220 may monitor and determine when there is insufficient, or anticipated to be insufficient, behind-the-meter power availability. As noted above, sufficiency may be specified by remote master control system 420 or datacenter control system 220 may be programmed with a predetermined preference or criteria on which to make the determination independently. An operational directive may be based on current dispatchability, forward looking forecasts for when unutilized behind-the-meter power is, or is expected to be, available, economic considerations, reliability considerations, operational considerations, or the discretion of the local station 410, remote master control 420, or grid operator 440. **WO'632 at [0044].**

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7	Optionally, the system also includes other components for cooling, air-filtration, and related features. **Complaint at ¶29.**	A flexible datacenter includes a mobile container, a behind-the-meter power input system, a power distribution system, a datacenter control system, a plurality of computing systems, and a climate control system. **WO'632 at Abstract.**
8	In the BearBox Technology, a controller (such as a power distribution unit, network interface, or the like) monitors various external factors, such as current and expected energy demand/pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the controller(s) determines appropriate times to mine cryptocurrency in accordance with a desired performance strategy (for example, profitability thresholds). At the appropriate times, the controller initiates mining, for example, by powering on the miners. **Complaint at ¶30.**	See #7 above. For example, local station control system 410, remote master control system 420, or grid operator 440 may issue an operational directive to flexible datacenter 200 to go offline and power down. When the datacenter ramp-down condition is met, datacenter control system 220 may disable power delivery to the plurality of computing systems (100 of Figure 2). Datacenter control system 220 may disable 435 behind-the-meter power input system 210 from providing three- phase nominal AC voltage to the power distribution system (215 of Figure 2) to power down the plurality of computing systems (100 of Figure 2), while datacenter control system 220 remains powered and is capable of rebooting flexible datacenter 200 when unutilized behind-the-meter power becomes available again. **WO'632 at [0044].**

67. The '632 application discloses better use of available energy resources to increase the stability of the energy grid, minimize a mining operation's impact on peak-demand, and alleviate electricity undersupply and/or oversupply conditions, all while decreasing the overall energy costs of the mining operation and increasing its profitability. *See, e.g.,* '632 application at [0041], [0054], [0055], [0077].

68. The '632 application discloses hardware and software components, including, structurally, a housing for a plurality of miners (such as ASICs, graphics cards, or the like) under the direction of a control system. *See, e.g.,* '632 application, Abstract, '632 application at [0023], [0024].

69. The ‘632 application discloses a control system monitoring various external factors, such as current and expected energy demand and pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the systems and/or methods of the ‘632 application may determine whether conditions are appropriate to mine cryptocurrency and, if so, subsequently mine the cryptocurrency.). *See, e.g.*, ‘632 application at [0030], [0039], [0040], [0044].

70. The ‘632 application discloses that its systems may also include other components for cooling, air-filtration, and related features. *See, e.g.*, ‘632 application, Abstract.

71. The ‘632 application discloses a control system that monitors various external factors, such as current and expected energy demand/pricing information, current and expected cryptocurrency pricing, and the like. Based on these external factors, the control system of the ‘632 application may determine times to mine cryptocurrency in accordance with a desired performance strategy, and the control system may initiate mining, for example, by powering on the miners. *See, e.g.*, ‘632 application, Abstract; ‘632 application at [0044].

72. Consequently, the ‘632 application discloses each aspect of the “BearBox Technology.”

73. The Complaint alleges that Storms sent McNamara “annotated system diagrams, component specifications, and modeled data sets to mimic real-world Bitcoin and energy prices.” Complaint ¶ 33. The Complaint does not allege that Storms sent any additional information to McNamara.

74. Austin Storms sent McNamara a total of seven text messages. The messages are dated May 3, 2019 through May 9, 2019. The text messages contain no proprietary, technology, or confidential information. *See* Exhibit C.

75. Storms sent Lancium a single email. The email was dated May 9, 2019. The body of the email contained no proprietary, technology, or confidential information. *See* Exhibit D. The attachments to the email were:

- a two-page PDF entitled BearBox Product Details Summary v1,
- an Excel spreadsheet containing purported modeling data with a third-party's name,
- two publically available third-party "spec" sheets for commercially available air filters, and
- a publically available third-party "spec" sheet for a commercially available exhaust fan.

76. The chart below proves that any alleged "BearBox Technology" in the email that Storms sent to McNamara had been previously conceived by Lancium and described in Lancium's WO'632 application.

10	**May 9, 2019 Email – Storms to McNamara**	**WO'632 Application**
10A	20' BearBox product details BearBox Product Details Summary v1.PDF discloses: • A 20' shipping container with networked miners, electrical system, cooling system. • Software for marketplace data (i.e., power pricing) and alerts (restart, reboot, and maintenance)	A flexible datacenter includes a mobile container, a behind-the-meter power input system, a power distribution system, a datacenter control system, a plurality of computing systems, and a climate control system. The datacenter control system modulates power delivery to the plurality of computing systems based on unutilized behind-the-meter power availability or an operational directive. **WO'632 at Abstract.** Datacenter control system 220 may monitor and determine when there is insufficient, or anticipated to be insufficient, behind-the-meter power availability. As noted above, sufficiency may be specified by remote master control system 420 or datacenter control system 220 may be programmed with a predetermined preference or criteria on which to make the determination independently. An operational directive may be based on current dispatchability, forward looking forecasts for when unutilized behind-the-meter power is, or is expected to be, available, economic considerations, reliability considerations, operational considerations, or the discretion of the local station 410, remote master control 420, or grid operator 440. **WO'632 at [0044].**

		For example, local station control system 410, remote master control system 420, or grid operator 440 may issue an operational directive to flexible datacenter 200 to go offline and power down. When the datacenter ramp- down condition is met, datacenter control system 220 may disable power delivery to the plurality of computing systems (100 of Figure 2). Datacenter control system 220 may disable 435 behind-the-meter power input system 210 from providing three- phase nominal AC voltage to the power distribution system (215 of Figure 2) to power down the plurality of computing systems (100 of Figure 2), while datacenter control system 220 remains powered and is capable of rebooting flexible datacenter 200 when unutilized behind-the-meter power becomes available again. **WO'632 at [0044].**
10B	[redacted]	A method of dynamic power delivery to a flexible datacenter using unutilized behind-the-meter power includes monitoring unutilized behind-the-meter power availability, determining when a datacenter ramp-up condition is met, enabling behind-the-meter power delivery to one or more computing systems when the datacenter ramp-up condition is met, and directing the one or more computing systems to perform predetermined computational operations. **WO'632 at Abstract.** Datacenter control system 220 may monitor and determine when there is insufficient, or anticipated to be insufficient, behind-the-meter power availability. As noted above, sufficiency may be specified by remote master control system 420 or datacenter control system 220 may be programmed with a predetermined preference or criteria on which to make the determination independently. An operational directive may be based on current dispatchability, forward looking forecasts for when unutilized behind-the-meter power is, or is expected to be, available, economic considerations, reliability considerations, operational considerations, or the discretion of the local station 410, remote master control 420, or grid operator 440. **WO'632 at [0044].** Advantageously, the flexible datacenter may perform computational operations, such as blockchain hashing operations, with little to no energy costs, using clean and

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		renewable energy that would otherwise be wasted. **WO'632 at [0022].** For example, if the one or more computing systems (100 of Figure 2) are configured to perform blockchain hashing operations, datacenter control system 220 may direct them to perform blockchain hashing operations for a specific blockchain application, such as, for example, Bitcoin, Litecoin, or Ethereum. **WO'632 at [0042].**

77. The '632 application discloses a container with networked miners, electrical system, and climate control system.

78. The '632 application discloses control systems for monitoring data, including economic data, and issuing commands.

79. The '632 application discloses control systems for starting and stopping computing systems within the container in response to changes in monitored data.

80. The '632 application discloses consideration of modeling parameters such as cryptocurrency price data, power price data, and hashrate of miners in the methods and/or systems of the '632 application.

81. Other than the above disclosed seven text messages and single email, Counter-Defendants had no other written communication with Counter-Plaintiffs until the filing of the Complaint approximately two years later.

82. Consequently, the '632 application discloses each aspect of the information contained in written communications from Counter-Defendants to Counter-Plaintiffs.

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COUNT I

DECLARATORY JUDGMENT: AUSTIN STORMS IS NOT AN INVENTOR OF THE ‘433 PATENT

83. Lancium repeats and restates paragraphs 1-82 of its Counterclaim as if fully set forth herein.

84. There is an actual controversy between Lancium and both BearBox and Storms regarding inventorship of the ‘433 Patent, which relates to methods and systems for adjusting power consumption based on power option agreements. The subject matter claimed in the ‘433 Patent was invented by Michael T. McNamara and Raymond E. Cline, Jr. and is assigned to Lancium, LLC.

85. Storms is properly not named as an inventor of the ‘433 Patent because, among other reasons, he did not contribute to, or collaborate with Messrs. McNamara and Cline in any way in the conception of the inventive subject matter claimed in the ‘433 Patent. Nor did Storms assist McNamara or Cline with reducing to practice (actually or constructively) the inventive subject matter claimed in the ‘433 Patent.

86. As sole assignee of the ‘433 Patent, Lancium owns all rights, title, and interest to the ‘433 Patent and, thus, has a recognized interest in the patent that could be adversely affected by the action brought by BearBox and Storms “seeking correction of the named inventors of a United States patent under 35 U.S.C. § 256.” Complaint at ¶ 11.

87. Specifically, BearBox and Austin Storms have alleged in the Complaint that:

- “The inventions claimed in the ‘433 Patent are inventions conceived by Storms,” Complaint at ¶ 5;
- “Defendants falsely identified themselves as the inventors of the claimed inventions, when, in fact, Storms is the sole inventor of the claimed inventions,”

Complaint at ¶ 42; *see also id.* at ¶¶ 38, 45;

- "McNamara and Cline, both officers of Lancium, were not the rightful inventors of the [] Technology disclosed in the ['433] patent and the inventions claimed in the patent," Complaint at ¶ 42
- "Defendants McNamara and Cline each submitted signed declarations falsely swearing that they were 'an original joint inventor' of the claimed subject matter," Complaint at ¶ 43.

88. Count 1 of the Complaint seeks "Correction of Inventorship for the '433 Patent: Austin Storms as Sole Inventor." Complaint at ¶¶ 51-54. In Count 1, BearBox and Storms each allege that "Storms is the sole inventor of the subject matter claimed in the '433 Patent," that Storms "was not listed as an inventor of the '433 patent" while "the currently listed inventors on the '433 patent were improperly listed," and that "[u]nless Defendants Lancium, McNamara, and Cline are enjoined from asserting that McNamara and Cline are the sole inventors of the '433 Patent in violation of U.S. federal patent laws, Plaintiffs will suffer irreparable injury." Complaint at ¶¶ 52-54

89. Count 2 of the Complaint seeks "In the Alternative, Correction of Inventorship for the '433 Patent: Austin Storms as Joint Inventor with the Currently Named Inventors." Complaint at ¶¶ 55-58. In Count 2, BearBox and Storms each allege that, "[i]n the alternative, Storms is a joint inventor of the subject matter claimed in the '433 Patent and should be added to the individuals currently named as inventors on the '433 Patent," and that "[u]nless Defendants Lancium, McNamara, and Cline are enjoined from asserting that McNamara and Cline are the sole inventors of the '433 Patent in violation of U.S. federal patent laws, Plaintiffs will suffer irreparable injury." Complaint at ¶¶ 56-58.

90. Counts 4 through 7 of the Complaint are each predicated on Counter-Defendants' unfounded assertion that McNamara and Cline misappropriated Plaintiffs' valuable intellectual property and incorporated it into the '433 Patent. *See* Complaint at ¶¶ 63-88. Once the Court declares that Storms is not an inventor of the subject matter claimed in the '433 Patent, Counter-Defendants ancillary causes of action necessarily fail.

91. The facts set forth herein show that there is a substantial and actual controversy between the parties in that they assert adverse legal interests regarding the inventorship of the '433 Patent, as demonstrated by Counter-Defendants' Complaint, which has caused, and will continue to cause, uncertainty, insecurity, and controversy regarding the inventorship of the '433 Patent.

92. The controversy is sufficiently immediate and real to warrant the issuance of a declaratory judgment because Counter-Defendants BearBox and Storms are both currently disparaging the inventorship of the '433 Patent, which adversely affects Lancium's business, including its efforts to enforce and license the '433 Patent. An actual controversy exists between the parties within the meaning of 28 U.S.C. § 2201. This Court is vested with the power to declare the rights, status, and other legal relations of the parties to this action with reference to the inventorship issues raised by Counter-Defendants in the Complaint, and to clarify and settle those issues.

93. Pursuant to 28 U.S.C. § 2201, et seq., and 35 U.S.C. § 256, Counterclaimants Lancium, McNamara, and Cline are entitled to a judgment declaring that Austin Storms properly was not named as an inventor on the '433 Patent.

WHEREFORE, Lancium, McNamara, and Cline, having answered Counter-Defendants' Complaint and Lancium having set forth its Counterclaim against Counter-Defendants, respectfully pray for the following relief:

A. That all of Counter-Defendants' claims be dismissed, with prejudice, and that judgment be entered in favor of Lancium, McNamara, and Cline, and against Counter-Defendants BearBox and Storms on all counts;

B. That the Court issue a declaratory judgment that Storms is not an inventor of the subject matter claimed in the '433 Patent;

C. That the Court issue a declaratory judgment that Storms was properly not named an inventor on the '433 Patent;

D. That Lancium, McNamara, and Cline be awarded their reasonable attorneys' fees and expenses in defending this action and in prosecuting the Counterclaims; and

E. That the Court award Lancium, McNamara, and Cline such other and further relief as the Court deems just and proper.

COUNT II

DECLARATORY JUDGMENT: BEARBOX HAS NO OWNERSHIP RIGHTS IN THE '433 PATENT

94. Lancium repeats and restates paragraphs 1-93 of its Counterclaim as if fully set forth herein.

95. There is an actual controversy between Lancium and both BearBox and Storms regarding ownership of the '433 Patent, which relates to methods and systems for adjusting power consumption based on power option agreements. The subject matter claimed in the '433 Patent was invented by Michael T. McNamara and Raymond E. Cline, Jr. and is assigned to Lancium, LLC.

96. BearBox and Storms are each properly not assignees of the '433 Patent because, among other reasons, Storms is not an inventor of the subject matter claimed in the '433 Patent.

97. As sole assignee of the '433 Patent, Lancium owns all rights, title, and interest to the '433 Patent and, thus, has a recognized interest in the patent that could be adversely affected by the action brought by BearBox and Storms seeking to name Storms as sole inventor or, in the alternative, as joint inventor of the '433 Patent.

98. Specifically, Counts 1 and 2 of the Complaint seek "Correction of Inventorship for the '433 Patent." Complaint at ¶¶ 51-58. In these counts, BearBox and Storms allege that Storms is either the sole inventor (Count 1) or a joint inventor (Count 2) of the subject matter claimed in the '433 Patent. See id.; see also, generally, Complaint at ¶¶ 5, 11, 38, 42, 43, 45 (alleging that Storms, and not Messrs. McNamara and Cline, invented the subject matter claimed in the '433 Patent).

99. In Count 3 of the Complaint (for conversion), Counter-Defendants allege that Storms "conceived, developed, and reduced to practice the '[433 Patent] Technology" and that "Plaintiffs own [this] Technology, related know-how, and related intellectual property." Complaint at ¶ 61. Counter-Defendants further allege that they "owned this property during all relevant time periods in this suit," and that Defendants assumed dominion and control over the [] Technology by claiming it as their own in the '433 patent," thereby "obtain[ing] the purported ability to exclude Plaintiffs and others from using the [] Technology. Complaint at ¶¶ 60-61. According to Counter-Defendants, "[t]his constitutes unauthorized and unlawful conversion by Defendants" and "Plaintiffs have been damaged by losing valuable intellectual property from which Plaintiffs would have derived substantial revenue via licensing and/or selling patented products." Complaint at ¶¶ 61-62.

100. Counts 4 and 5 of the Complaint are predicated on Counter-Defendants' unfounded assertion that Messrs. McNamara and Cline misappropriated Counter-Defendants' valuable

intellectual property and incorporated it into the '433 Patent. *See* Complaint at ¶¶ 63-73. Once the Court declares that Lancium is the sole owner of the intellectual property in question, Counter-Defendants ancillary causes of action necessarily fall.

101. The facts set forth herein show that there is a substantial and actual controversy between the parties in that they assert adverse legal interests regarding the ownership and enforceability of the '433 Patent, as demonstrated by Counter-Defendants' Complaint, which has caused, and will continue to cause, uncertainty, insecurity, and controversy regarding the ownership and enforceability of the '433 Patent.

102. The controversy is sufficiently immediate and real to warrant the issuance of a declaratory judgment because Counter-Defendants BearBox and Storms are both currently disputing the ownership of the '433 Patent, which adversely affects Lancium's business, including its efforts to enforce and license the '433 Patent. An actual controversy exists between the parties within the meaning of 28 U.S.C. § 2201. This Court is vested with supplemental jurisdiction over this Counterclaim and the power to declare the rights, status, and other legal relations of the parties to this action with reference to the ownership and enforceability issues raised by Counter-Defendants in the Complaint, and to clarify and settle those issues.

WHEREFORE, Lancium, McNamara, and Cline, having answered Counter-Defendants' Complaint and Lancium having set forth its Counterclaim against Counter-Defendants, respectfully pray for the following relief:

A. That all of Counter-Defendants' claims be dismissed, with prejudice, and that judgment be entered in favor of Lancium, McNamara, and Cline, and against Counter-Defendants BearBox and Storms on all counts;

B. That the Court issue a declaratory judgment that Lancium is the only owner

of all right, title, and interests to the '433 Patent;

C. That the Court issue a declaratory judgment that Counter-Defendants BearBox and Storms, either individually or collectively, have no ownership rights in the '433 Patent;

D. That Lancium, McNamara, and Cline be awarded their reasonable attorneys' fees and expenses in defending this action and in prosecuting the Counterclaims; and

E. That the Court award Lancium, McNamara, and Cline such other and further relief as the Court deems just and proper.

COUNT III

DECLARATORY JUDGMENT THAT LANCIUM, MCNAMARA, AND CLINE DID NOT STEAL OR OTHERWISE IMPROPERLY OBTAIN OR USE ANY INFORMATION FROM BEARBOX AND STORMS

103. Lancium repeats and restates paragraphs 1-102 of its Counterclaim as if fully set forth herein.

104. The Complaint filed by BearBox and Storms against Lancium, McNamara, and Cline accuses each of them of "theft of inventions" belonging to BearBox and Storms.

105. The Complaint at paragraphs 25-31 describes the "inventions" allegedly stolen from BearBox and Storms by Lancium, McNamara, and Cline.

106. As described above, Lancium, McNamara, and Cline did not steal, improperly obtain, or use any information from BearBox or Storms.

107. Any information given to McNamara from Storms was provided without any claims that BearBox or Storms owned the information and without any claim or notice that the information was confidential.

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108. Further, the information described in paragraphs 25-31 of the Complaint could not have been confidential to BearBox or Storms because it was publicly available.

109. There is an actual controversy between Lancium and both BearBox and Storms in that they assert adverse legal interests regarding whether Lancium, McNamara, and Cline stole or otherwise improperly obtained or used confidential information from BearBox and Storms.

110. The controversy is sufficiently immediate and real to warrant the issuance of a declaratory judgment because BearBox and Storms are both currently asserting that Lancium, McNamara, and Cline have stolen technology and confidential information, which adversely affects Lancium's business. An actual controversy exists between the parties within the meaning of 28 U.S.C. § 2201. This Court is vested with supplemental jurisdiction over this Counterclaim and the power to declare the rights, status, and other legal relations of the parties to this action with reference to the theft and trade secret misappropriation issues raised by BearBox and Storms in their Complaint, and to clarify and settle those issues.

WHEREFORE, Lancium, having answered Counter-Defendants' Complaint and having set forth its Counterclaim against Counter-Defendants, respectfully prays for the following relief:

A. That all of Counter-Defendants' claims be dismissed, with prejudice, and that judgment be entered in favor of Lancium, McNamara, and Cline, and against Counter-Defendants BearBox and Storms on all counts;

B. That the Court issue a declaratory judgment that Lancium has not stolen or otherwise improperly obtained or used any information from BearBox or Storms;

D. That Lancium be awarded its reasonable attorneys' fees and expenses in defending this action and in prosecuting the Counterclaims; and

E. That the Court award Lancium, McNamara, and Cline such other and further relief as the Court deems just and proper.

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